Public Policy Topics of Interest to the Industry

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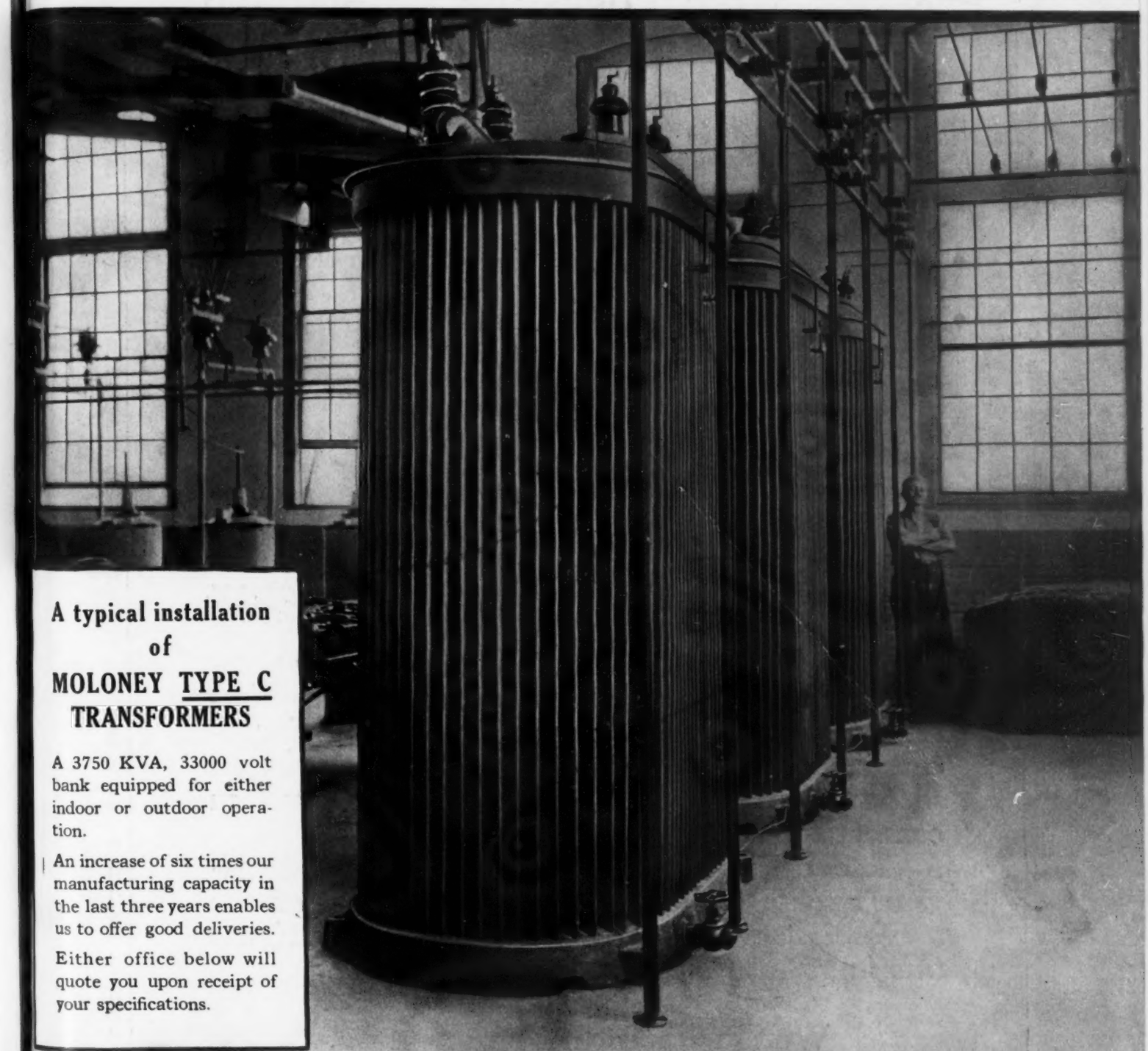

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Electrical World

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The N. E. L. A. in the Service

NO PAST National Electric Light Association convention voiced the powerful purpose for national service which will dominate the brief proceedings at next week's patriotic gathering. Smaller in number, less vital to other industries, totaling much lower values in invested capital, the association was in a very different position during the relatively unimportant Spanish-American War. Now one of the greatest industrial forces, capably designed, efficiently managed, it is ready and willing to do the utmost in large human and machine accomplishment. Its work and the broad scope of its committees and sections were preparation for the conditions of to-day. They are training which better fits the whole industry to step into its necessary place, to enter the war machine which is to be driven hard to bring peace. No happening could reveal more clearly the true usefulness of the association as a central agency for mobilization. Current affairs will wait; the industry is in the government service for the duration of the war.

Lighting Contracts and Present Prices

CENTRAL station companies which are about to renew city street-lighting contracts find new factors in the problem. The cost of electrical energy having steadily decreased because of improved apparatus and larger production, a company was justified in assuming that a long-term street-lighting contract would likely become more profitable as time went on. The present uncertainty of coal prices, however, as well as the price of everything else used by utilities, naturally causes companies to be cautious about making street-lighting rates—or for that matter any long-term power contracts—at very close margins. On the other hand, if a street-lighting contract which formerly yielded little or no profit is to be renewed to advantage and provide for some future increase, the price is likely to be so high as to cause unfavorable comment. The possibility of referring such matters to a public service commission somewhat relieves the situation, but it is well for all concerned to remember that whatever contract is entered into there should be sufficient flexibility in its terms to provide for changes in production costs during its life. While commission regulation permits of such changes in some states, a definite understanding that the question of price can be brought up for readjustment at various times by either party is likely to save friction later on. The indeterminate form of street-lighting contract which has been advocated by some central station men in quarters where municipal ownership sentiment has been strong offers one solution. Such a form of contract has the advantage of recognizing the necessity for readjustments and also provides the means for changing apparatus with advances in the art without loss or injustice to either party.

A Word to Manufacturers

IT IS becoming increasingly evident that if American manufacturers of electrical goods expect to develop the South American markets they must be prepared at once to co-ordinate many of their endeavors for a common purpose. To prevent overlapping, smaller firms must group themselves into an association having a carefully organized financial system and proceed to restrict competition and to encourage specialization among its members. They can gain export trade rapidly and surely only in so far as each ceases to exploit in foreign markets certain lines of merchandise made by some other firm in the group. Joint selling organizations manned by experts and adequately equipped are necessary with joint sales departments and warehouses in all large cities. A joint catalog issued in Spanish and in Portuguese is also a prerequisite. While the necessary legislation permitting such export associations has not yet been passed, it is the part of wisdom to be prepared to carry out the scheme as soon as Congress stamps it with its approval. With such an association of specialized firms the maximum appeal can be made and the quickest results obtained. England and Germany have managed to conquer foreign markets partly by such means, and we should profit from their experience or offer something better. We have the goods, but lack the organization.

Enlistment of Central Station Employees

TO A certain extent the central stations of the country are placed between the devil and the deep sea by the war. On the one hand, they must, for the public welfare and for the manufacturing industries, maintain undisturbed their full supply of energy and probably increase it. On the other hand, they cannot and do not discourage the enlistment of employees for actual service. It is a difficult situation. Trained men with electrical experience are needed in large numbers for the engineer regiments which will have to be formed, and yet they cannot be well spared without cutting down the working efficiency of the plants. How shall the situation be handled so as to keep the central stations at high efficiency without in any way discouraging patriotic men in their desire to serve their country? As time goes on there will have to be a vast overhauling of the general situation so as to keep up industrial

activity commensurate with the needs of military operations. It requires from three to four men behind a firing line to supply with material one man upon it. All this will have to be taken into consideration when the selective draft is put in operation, but every industry will be pleading for exemption on the ground of national necessity, and the just distribution of the burdens will be a most serious problem for the government.

It seems to us that, considering the situation broadly, the wisest policy for central station companies in conserving their own efficiency and the efficiency of their men would be to say to their employees: "You are technically trained men who can be of the greatest service to your country in doing specialized work, and are no better than others in the common duties of the soldier. If you feel that you ought to enlist, enlist in an engineer regiment or in some other body where your training will make you particularly valuable. Good fortune go with you! We will stand by you, first, last and always."

When the draft comes strong representation should be made on this subject so that men should only be drafted from the ranks of technical workers in so far as their services will be of more use to the specialized branches of the army in active service than to the task of supplying its needs behind the lines. It would be a pity to waste a first-class man for the engineers, the signal corps or the quartermaster's department in order to make merely an average infantryman or cavalryman.

The loss of a large number of valuable men to the service of the electric lighting companies even with this rational method of selection will be inevitable, and the industry must make the best of it, taking in and training up technical recruits as best it may. But if there is a definite effort to call men from highly specialized industries necessary to public service only in so far as their skill and experience are needed in technical functions, a principle of selection will be established which will tend toward the greatest efficiency of the whole military establishment both at the front and in the not less necessary operations far in the rear.

Exploiting the Electric Truck

THE Hartford Electric Light Company, which for a good many years has been pretty near the advance guard of central station practice, has worked out a plan of dealing with the electric vehicle which deserves more extensive trial. The account which we published last week shows how in the last four or five years a considerable electric vehicle load has been taken on to the advantage both of the station and the consumers. Though it has a splendid record for usefulness when properly handled, the ordinary man is a little cautious about taking up the electric vehicle on account of the charging difficulty and the possibility that the truck may be out of service just when it is most needed. To meet this situation the Hartford company evolved a very ingenious and skillful battery exchange plan.

The company buys and charges the batteries and makes the change whenever required, for which service a flat sum is paid plus a mileage charge. It takes ordinarily less than three minutes to change batteries—in fact, less time than would be necessary to fill up the gasoline tank of a gas truck—and the "electric" can start out for a day's work in prime condition. The changing of batteries is commonly done during the early morning, and the batteries themselves are charged during the off-peak hours. By working in this way the user of an electric truck can be relieved of nearly all the bother connected with its operation, and consequently finds it regularly in service with very small delay on account of necessary repairs. The Hartford experience indicates that by means of battery exchange an electric truck is actually in service a good many more days a year than any gasoline truck and that its operating costs all told are distinctly light. Were the battery exchange system more widely adopted the use of electric trucks would be vastly greater than it is now, and the same would be true of other electric vehicles. If war-time conditions have anything like the effect here which they have had elsewhere, increasing prices for gasoline will put the electric vehicle emphatically on the right side of the balance sheet, and the extension of its use will become chiefly a question of providing exchange stations enough to obviate the delays due to charging.

Serving Small Communities

WE HAVE over and over referred to the admirable results which can be obtained on a small scale, provided that service projects are not unduly expanded but carried out strictly with reference to the needs of the situation. A brief paper in the current issue lends emphasis to what we have already discussed. The work carried out in this case is exceptional even in this minor class of operations. The place to be served was a village of only 600 inhabitants, and the local generation of electricity in such a case did not seem feasible. The town wanted light and the only available source was eleven miles away. Consequently the citizens got together and provided for a bond issue as a municipal undertaking, buying the energy, erecting the transmission and distribution system, and retailing to the consumers. The bond issue was arranged also to cover a ten-dollar installation charge for each house and business establishment in the town.

The interesting part of the construction is the transmission line. Plans were first laid for an ordinary wooden-pole line, but the cost seemed to run high and a change was made to a combination somewhat unusual. Steel A-frames were used for the transmission and strung with a steel-cored aluminum wire, chiefly on account of its comparatively low cost and large tensile strength. The town went into the house-wiring business to insure low cost and good construction, with the result that at the present time 90 per cent of the buildings in the town are wired for service. Energy is metered at 12 cents per kilowatt-hour, by no means a high price for a small community, and as the town buys its energy for transmission at 3 cents per unit the excess was enough to meet interest on the bonds, depre-

ciation and operating charges from the very beginning of the service. It is interesting to note that the total cost of providing the service facilities by the town was only slightly over $12,000, which sounds like a record low figure for work involving so long a transmission for so small an amount of power. It is an excellent example of the way in which by general interest on the part of the public and careful management service can be secured on reasonable terms even in a very small community.

Reliability of Porcelain Insulators

SO RAPID have been the strides made in the electric transmission of power that engineers and others are apt to forget how short is the space of time between what was and what is and how great has been the change in practice in the interim. This is especially true of the developments in porcelain insulator design, without which the vast high-tension networks which have sprung up in this country in recent years would be impossible. True, there have been troubles, as there must be in all new development work, but these troubles have been speedily surmounted. When one recalls how insulators stood up five years ago under what was then thought to be a very severe test and considers how they behave to-day, there is no escaping the conclusion that porcelain manufacturers have made great improvements in the quality of the porcelain they have produced, and that they now turn out something which will serve the purpose.

Electric service interruptions due to insulator failures are now about one-eighth as frequent as they were five years ago, and with closer co-operation between transmission-line engineers and porcelain-insulator manufacturers this will be still more reduced. The line insulator to-day is no longer the weakest link in the system, and such difficulties as manifest themselves are more mechanical than electrical in their origin.

The real problem of manufacture at the present time is not so much the question of electrical design to meet abnormal conditions as one of keeping down depreciation to an exceedingly small value for a period of years. Great advances have been made by the manufacturers in vitrification, and the care now given to small details in design and assembly so as to keep down internal stresses and thereby reduce the danger of cracking with time has shown its advantages in operation. Definite air bubbles or laminations due to defective pugging, folds in the porcelain while it is being jiggered, excessive pressure due to tools squeezing out moisture around sharp corners which subsequently may cause a partial fault in drying or prevent the insulator vitrifying later in the kiln, the underfiring of the kiln itself —all these preventable causes of failure in the finished insulator have been carefully guarded against. Well-made insulators of good design are as lightning-proof and puncture-proof as human skill probably can make them. The credit for most of the work belongs in large measure to the engineers of the manufacturing companies, who have combined their knowledge of electricity with the painstaking and scientific study of ceramics. While insulator reliability becomes increasingly important as transmission distances increase and the requirements of the service become more exacting, these conditions can be best met by a free and frank exchange of experience with the manufacturers of porcelain insulators, to whom the industry must look for the product that is requisite.

Current Prices of Electrical Supplies

IN KEEPING with its established policy of rendering to its readers complete and unexcelled service, the ELECTRICAL WORLD begins this week the publication of prevailing prices of electrical supplies in Eastern and Middle Western markets. These prices, which will be a regular feature of the ELECTRICAL WORLD, apply to standard apparatus and appliances in broken and standard package lots intended for resale by contractors, central stations, dealers and others. Coupled with the regular weekly review of trade and market conditions, the prompt and uncolored description of all new apparatus brought out by manufacturers and the well-known authoritative news service of the ELECTRICAL WORLD, by which its readers are the first to be put in possession of all the important news of the industry, this one section of the ELECTRICAL WORLD should be of inestimable value to the jobbers, dealers and contractors of the country. The publication of the prices should also have an excellent influence on the market. This added service does not curtail one iota the technical, operating and managerial features which are characteristic of the ELECTRICAL WORLD and on which its reputation as the great American electrical technical journal is founded.

The Coming Issues

WHILE the National Electric Light Association will not hold its great annual convention as usual, the representatives of operating companies who have looked forward to this event for a new fund of information will not be disappointed, since the ELECTRICAL WORLD has arranged to publish abstracts of all of the papers and committee reports intended for the Atlantic City meeting. These summaries, as well as accounts of the proceedings of the N. E. L. A. meeting which will be held in New York City on May 9 and 10, will be presented in the next issue of the ELECTRICAL WORLD. The subsequent number, which is the engineering issue, will contain an article on the causes of underground-cable failures and suggestions for their remedy. A paper on measuring reflection factor and the final installment of the article by Walter Arthur on the characteristics of standard inclosed fuses, the first part of which was published on March 10, will also appear in the May 19 issue. The fourth issue of the month, that for May 26, will contain, in addition to the regular departments, special articles on commercial and management topics and illumination.

Small-Town Electric Service Problems

Steel Poles Used in Distribution System—Steel-Cored Aluminum Wire Employed in Both Transmission and Distribution Lines—Bond Issue Provides for House Wiring

PRECEDENT and general practice were both very largely disregarded in bringing electric service to Pomona, Kan., a town with 600 inhabitants. The load available was so small (15 kw.) that the installation and operation of a generating plant did not seem feasible when compared with the possibility of securing energy by transmission line from a generating station at Ottawa, Kan., 11 miles (17.7 km.) distant. The latter plan was adopted and the contract for building the line and the Pomona distributing system was let on a cost-plus-a-fixed-profit basis to the Bushong Electrical Works of Ottawa.

FIGS. 1, 2 AND 3—THREE-WIRE SECONDARY AND STREET-LIGHTING CIRCUITS ON BRACKET FIXTURES; REINFORCED ALUMINUM-WIRE TRANSMISSION LINE, AND GUYED-POLE CONSTRUCTION AT RAILROAD CROSSING

The original estimate which this firm made, basing its figures on the proposed use of wood poles and copper wire, was $13,600. This figure covered the total cost including the bond election, a provision for house wiring in Pomona, meters and line work complete. A desire for more sturdy construction, however, led to the making of another estimate and the decision to build both the transmission line and the distribution line on steel poles of the type made by the Carbo Corporation of South Chicago. It was also decided to use bare steel-cored aluminum wire on the transmission line and weatherproof steel-cored aluminum wire in the distribution system, instead of copper, as specified in the original estimate, because of saving in first cost.

In carrying out these plans 25-ft. (7.6-m.) A-frame earth-anchored line towers were used except at road crossings and in low places, where 30-ft. (9.1-m.) towers were used to increase clearance and to grade the line. The poles are placed 250 ft. (76.2 m.) apart and are equipped with Hubbard 36-in. (90-cm.) steel cross-arms and No. 86 pins. At corners four-legged earth-anchored towers set 5 ft. (1.5 m.) deep, were used. On these towers the line was dead-ended on strain insulators fastened one above the other directly to the center of the pole. This arrangement avoided using heavy corner cross-arms and gave added strength. No. 4 B. & S. steel-cored, stranded-aluminum wire was used because its tensile strength is greater than copper and because it permits the use of longer spans and less sag with resulting reduced first cost on the line. The cross-sectional area selected gives a conductivity equal to that of copper considered in the first estimate. The wire was strung to give a 17-in. (42.7-cm.) sag at 70 deg. Fahr. (21.1 deg. C.) and has caused no trouble.

The transmission circuit receives 60-cycle, single-phase energy from a 15-kw. transformer tower at Ottawa, where the pressure is increased from 1100 volts to 6600 volts. At the Pomona end of the line the potential is reduced to 220-110 volts in three distributing transformers, which are rated at 7.5 kw., 5 kw. and 3 kw. respectively. They are situated near the load centers and are banked on the three-wire secondary system. The secondary mains in Pomona, which are of No. 0, No. 2, No. 4 and No. 6 steel-cored, weatherproof aluminum, are also supported on A-frame towers ranging in height from 20 ft. to 40 ft. (6.1 m. to 12.2 m.). In town the pole spacing varies from 120 ft. to 165 ft. (36.6 m. to 50.3 m.). The distribution network, including the street-lighting circuit, involved the

TABLE I—TOTAL COST OF PROVIDING SERVICE FACILITIES

Transmission and distribution line material	$7,305.15
Meters	680.20
House-wiring material	787.40
Labor and engineering fee (including work on house wiring and on lines)	3,192.25
Bond election, expense of printing bonds, etc.	287.00
Total	$12,252.00

erection of about 6 miles (about 9.7 km.) of pole line.

For town work the steel poles were found to have several advantages over wood. They will, it is believed, give longer life; they stand the side strain from service connections better; they provide more convenient mounting space for brackets; they are neat in appearance, and they can be erected with less labor expense

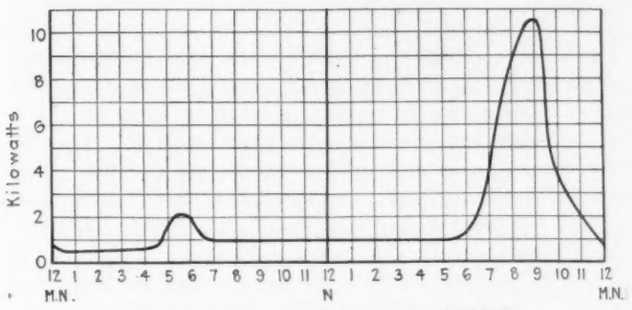


FIG. 4—LOAD CURVE ON APRIL 5, 1917

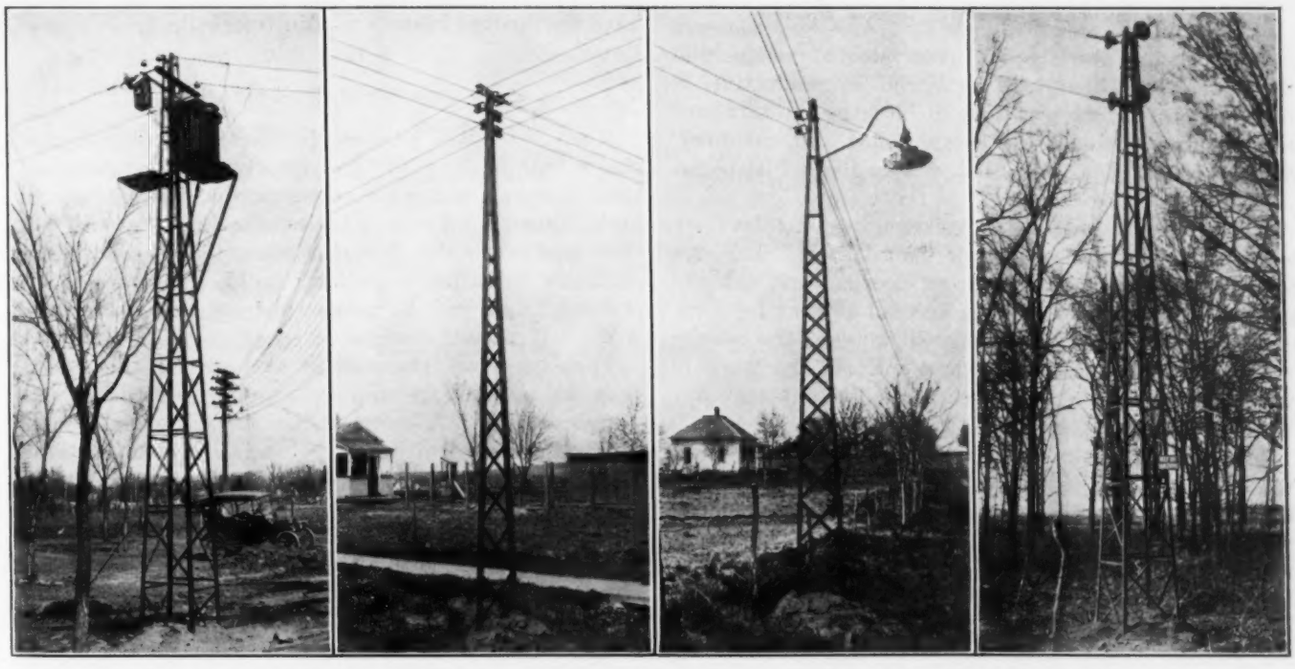
than wood. Cross-arms are used on no poles in town, except those carrying the 6600-volt circuit. All secondary lines are supported on Hubbard No. 561 bracket fittings bolted to the top of the tower, the spacing of which is sufficient to accommodate a 0.5-in. (1.27-cm.) bolt. At corners and at dead ends it was possible to use this fitting by properly staggering the units and by attaching them so they would take the strain. Avoiding buck arms also helped reduce the initial investment.

The street-lighting system, which consists of Westinghouse adjuster-socket units, takes energy from the 6600-volt line through a transformer controlled by a time switch in the secondary leads. The system consists of thirty-six lamps, of which thirty-one are 100 cp. type C bracket type and five are 250-cp. type C Cutter suspension type. The street-lighting circuit also consists of No. 6 steel-cored aluminum wire.

While the original estimate for the completed job was $13,600, the system was actually installed complete for $12,252, including the fixed charge for engineering and supervision made by the contracting company. A detailed statement of the total cost of providing service facilities is given in Table I. To produce immediate revenue which would cover interest and depreciation charges as well as service bills, the bond issue was arranged to pay $10 of the cost of wiring each home and business house in Pomona. The city went into the wiring business and did all work at cost under the direction of its engineers to be sure that all wiring was up to Code requirements. The result was that the system started with 80 per cent of the buildings in town using, or about to use, electric service. Since then an additional 10 per cent has been gained, making the total number of customers 110 out of a population of 600. Furthermore, by charging 12 cents per kilowatt-hour retail for energy the city, Dr. J. F. Vigor, city clerk, declares, has been able to meet interest, depreciation and energy charges from the very first, the city crediting the lighting fund $40 per month for street lighting. Pomona pays 3 cents per kilowatt-hour for energy at the Ottawa switchboard, with a fifty-dollar monthly minimum charge. From Table II it is interesting to observe that the average cost of energy is less than the probable cost of the services of one power-plant operator.

TABLE II—COST OF ELECTRICITY FURNISHED TO POMONA

	Kw.-hr.	Cost
From Dec. 8, 1915, to Dec. 29, 1915	1421	$42.63
January, 1916	2860	85.80
February	1955	58.65
March	1926	57.75
April	1510	43.50
May	1940	58.20
June	1532	45.96
July	1676	50.28
August	1922	57.66
September	1943	58.29
October	2340	70.20
November	2489	74.67
December	2772	83.16
January, 1917	2396	71.88
February	2069	62.07
March	2012	60.36
Average excluding December, 1915	2089	$62.68



FIGS. 5, 6, 7 AND 8—TRANSFORMER FEEDING OTTAWA-POMONA LINE; STAGGERED INSULATORS ON CORNER POLE; USE OF BRACKET FIXTURES FOR DEAD-ENDING SERVICE AND STREET-LIGHTING CIRCUIT, AND CORNER-POLE CONSTRUCTION

What Would You Do as General Manager?

A Lifetime Worker and Executive in the Industry Tells How He Would Develop the Business if He Were in Charge of the Average Small Central Station Company To-day

AN UNSIGNED INTERVIEW

THE ELECTRICAL WORLD has asked me to discuss the opportunities for commercial expansion which are before the industry and to state specifically what I would do if I were a general manager of an average small central station company and wanted to develop the territory.

It is my opinion that the general manager of such a company should first join the National Electric Light Association in order to receive the benefit of the information and assistance which it gives through its commercial work. This assumes, of course, that the general manager has a good knowledge of efficient operating methods and is applying it to good advantage.

Upon the understanding that the company has a well-developed lighting load the general manager should endeavor next to get the power load in the industries in his city or town. Then he can direct his effort toward development in the field of utilitarian devices for the home. These campaigns will lead along successive lines of least resistance, and the company will need to progress in each of these directions in order to attain the most economical average cost of production possible in the community served.

PULLING THE DOORBELL WON'T DO IT

In following these broad principles of commercial management no plan will be found so productive of necessary information as that of blocking the territory and making a survey of every house and customer, actual and possible. This will reduce the actual possibilities to definite data.

The work of studying the territory cannot be done successfully by men who lack imagination. Any one who is content to pull the front doorbell and ask the number of people in the house instead of studying each case as an individual problem will not get the results required for systematic development. If the work is well done—and it is not worth doing in any way but well—it will be expensive.

In making the survey the manager will have in mind the question of whether or not the gross revenues of the company show the right average number of dollars per capita. This record of results from the territory will be one of the best tests of the efficiency of the accomplishments of the organization.

The general manager will find it profitable to devote his personal time to the study of commercial possibilities and to the study of not only ordinary salesmanship, but also efficiency salesmanship and how he can build men to sell. He ought to train himself to become a salesman or commercial engineer. The need to-day is for not only operating knowledge, but also to combine that with commercial knowledge.

CONCENTRATION STILL PROGRESSING

In all plans it is advisable to look to the future. Concentration of central station units and concentration within the industry generally are still progressing. Betterment of quality and reduction of cost are still the aim. Barring the possibility that present high costs will be permanent, future development will be along the lines of better quality and reduced cost, and therefore will be largely a continuation of the character of the work in which the industry has been engaged for the last fifteen years.

Central stations have large markets before them for power in the vast and ever-widening scope of industries which they serve. In all of these industries the tendency will be more and more toward the use of labor-saving machinery. Industries which heretofore have not felt the urgent necessity of introducing scientific methods of efficiency will find it desirable in the future to develop such methods so as to promote economy. For if this country is to go far in the new competition which it will face when the war is over it will do so only by the recognition and introduction of the most efficient and economical means of production.

Increased costs of materials, higher wages and shorter hours of labor are very serious factors in the competition which the industries of this country will find from producers. To meet these conditions our industries will have to undergo certain readjustments in their operations.

GIVE INDIVIDUAL STUDY TO CASES

Much more will be done by electrically driven machines than in the past. The opportunities in this direction, however, will have to be studied individually in each industry. Some factories, for instance, will get increased production from the use of electrically driven machines operating at uniform speed, and in others increased output will be developed by the use of motors which will permit changes of speed.

Then there are the various avenues for the use of electrical energy which may be classified roughly as semi-industrial. A large number of utilitarian devices are being built which are motor-driven. At first the use of these was considered more or less of a luxury. Then these came to be regarded more and more as necessities. The causes of the change in the attitude of the public are somewhat similar to those which are producing revolution in the purely industrial conditions. They go back generally to the higher cost of living. Many people cannot afford servants as in the past, and housewives do a good deal of their own work. They want motor-driven devices which lessen work and reduce costs.

Outside of the large group of devices of this sort which are finding an ever-widening market there is the electric range. Intelligent housewives are able to handle this labor-saving apparatus so that in many instances the cost of operation is no greater than that of the old-time coal or gas range.

For the full realization of the large possibilities in

these directions co-operation and co-ordination of effort are essential. We discuss in general terms the opportunities for enlargement of markets, but we cannot appreciate what they mean in any given territory without following a plan of study and analysis especially adapted to the conditions found in a particular case. That a study be made of the total possibilities is certainly vital to the industry. In the last few years some of the central station companies have done wonders in analyzing and classifying the markets open to ultimate capture.

For the central station industry as a whole the large avenue for future commercial development is in the industrial plant load. Because of the diversity in the various classes of industries in the United States a great deal of development work and study is necessary in order that electricity may be applied to meet the specific requirements in various plants.

In dealing with the question of steam railroad electrification we have only one industry to study. And in street railway development only one industry is concerned. In the problem of lighting, also, only one method of study is needed; but in the application of power to cotton mills, rolling mills, textile mills and the multitude of other classes of great industries each line of activity means an individual study.

What the General Manager of a Small Central Station Company Should Do

He should join the N. E. L. A. and use its commercial information.

Assuming a well-developed lighting load, he should get the power load.

Then the effort may be directed to utilitarian devices for the home.

Make a survey of every house and customer, actual and possible. It will be expensive, but it will pay.

Devote personal time to the study of commercial possibilities and of efficiency salesmanship.

Build men to sell. The need to-day is for operating knowledge and for combination of that knowledge with commercial knowledge.

Continue to aim at better quality and reduced cost. Barring the possibility that present abnormal costs will remain, high quality of service and low cost will be the lines of future development.

Look for the ever-growing opportunities in electrically driven machines. Industrial needs and competition will give more force to the demand for labor-saving machinery.

Remember that the high cost of living means that motor-driven devices for the home are being regarded more and more as necessities.

Prove the case to every manufacturer. Classify the possibilities and study intensively the requirements of every line of industry.

Watch for the opportunities everywhere.

PROVE YOUR STATEMENTS

Conditions surrounding the markets in each case have to be taken into separate consideration. We cannot argue regarding power applications as we can with lighting. That electricity is used universally for lighting, that it is the best source of energy for artificial lighting and that people have come to accept that as fact simplifies the argument there. But we have to prove the statement that electrical energy is the best source of power for an individual manufacturer, we have to classify the possibilities and give the most intensive study to the requirements of a special line of industry before we can be sure of securing the load which it offers.

Central stations are properly looking for enormous power loads in the future. They will profit most from these loads if they study in acquiring them the influence of the factors of volume and diversity.

NEW CONDITIONS WILL INCREASE DEMAND

While development in the last few years has been on an enormous scale, it has not nearly reached the point of saturation of markets because new methods of distribution and new study and conditions will increase the demand for energy. Still greater increases in central station output and in the market for lamps will follow. We shall see a still wider application of flood-lighting and also better methods of lighting both indoors and outdoors. Only in very small communities will dark streets be found.

Before the saturation point can be reached in the application of energy to industrial power requirements great development will take place. We shall get away from the past practice of indiscriminately furnishing motors of given sizes without making careful studies of the uses to which motors are to be applied. Better co-operation in the industry at large will help in the realization of all of these possibilities. More commercialism and less engineering will promote commercial possibilities in all sections.

OPPORTUNITIES ALWAYS PRESENT

Present prosperity affords splendid opportunities for central stations. In such good business times as the country is now enjoying central stations often get a portion of the business of established industries. Conditions in those industries make it necessary that they shall provide for rapid increases in the demand for their products which they believe are only temporary. By installing motors these industries are enabled to avoid or postpone the introduction of new prime movers.

By getting part of the load under these conditions central stations have the chance to demonstrate in the best way the reliability and other advantages of their service and in many cases develop connections which they continue to hold permanently. Finding that the conditions are all that the central stations claim for them, such industries are likely to continue to be customers.

In periods of hard times also the central stations find opportunities. In such periods some industries operate only a part of their plants with central station energy at a lower expenditure than would be required for the operation of their entire plant through their own power and they are likely to remain permanently as customers.

In reality all conditions afford opportunities for the increase of the industrial power load, but they require the most intensive and careful individual study.

Such study can be given only with trained men, those who understand that the customer has his own point of view and are determined to approach that point of view sympathetically. Such men can be found and developed. While they are working to develop business they will incidentally present the point of view of the utility and will strengthen public relations.

BENEFIT FROM A BLOW AFTER ELECTRIC SHOCK

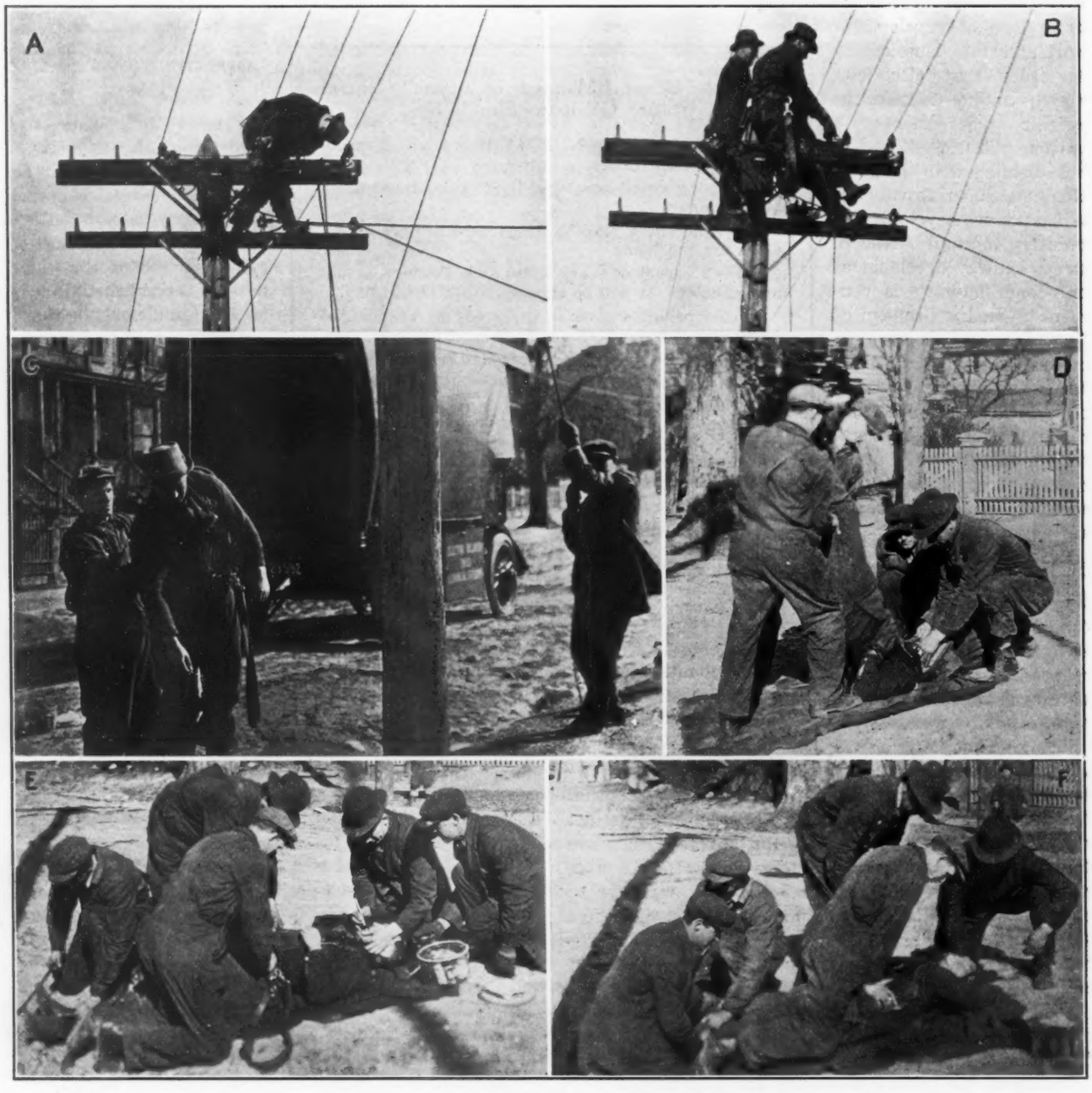
Another Case Where Man Rendered Unconscious by Electricity Was Resuscitated Without Special Apparatus

BY W. P. STRICKLAND

General Inspector New York & Queens Electric Light & Power Company

Recently the writer's attention was called to another case where a man rendered unconscious by contact with a 2200-volt circuit was resuscitated by the method outlined in the explanatory caption under the accompanying illustration. Although the man suffered the loss of a thumb on one hand and a little finger on the other, he is alive and well to-day. Just two days before this accident a man in a nearby district was fatally shocked by the same voltage. It is the writer's belief that his life could have been saved by the method pictured on this page.

In the other cases mentioned in the writer's last contribution on this subject it appeared that blows given to the patients were chiefly responsible for their reviving. In one case the man was restored to consciousness by falling from the pole he was on, and others were revived by striking the soles of their feet or allowing their body to drop on the ground.



RESCUING AND RESUSCITATING SHOCKED LINEMAN

A—Through carelessness or accident the lineman shown has received a shock. B—Rescuers have cut the live lines and are preparing to lower the injured lineman to the ground. C—The shocked lineman has been lowered from the cross-arm on which he was working by a line slung around his chest and has been allowed to drop the last three feet to the ground, the jar helping in restoring him to consciousness. D—The injured lineman has been lifted by the heels with his head resting on the ground so that his body may be dropped, the shock thus inflicted aiding in resuscitation. E—The patient's clothes are being loosened and his mouth has been wedged open preparatory to clearing his throat and withdrawing his tongue to facilitate respiration. Throughout these operations the injured man's soles are struck vigorously with anything at hand—connectors, chisel or club. A medicine kit, tongue forceps and mouth wedge were brought by the rescuers answering the emergency call. F—Awaiting means for producing respiration by mechanical apparatus, the Schaeffer prone method of artificial respiration is applied. Striking of the feet is also continued.

Trend of Regulation in California

Policies of the Past, Under Which $200,000,000 New Money Has Been Invested in Three Years, Will Be Continued — Questions Involved in San Francisco Rate Investigations

BY MAX THELEN

President National Association of Railway Commissioners and President Railroad Commission of California

DURING 1917 the Railroad Commission of California hopes to continue to be of service to the patrons of all the public utilities of that State, as well as to the utilities themselves, in matters great and small.

The commission will pursue the same policy, whereby more than $200,000,000 of new money has been invested in additions, betterments, extensions and new construction of the facilities of California public service companies during the last three years, and by which the securities issued by these utility corporations have come to command a ready sale in the financial markets of the world.

The functions of this commission were materially broadened by the legislative act approved Dec. 23, 1911, and effective March 23, 1912, which extended its jurisdiction to cover all gas, electric, telephone, telegraph and water utilities operating in unincorporated territory, and which was amended to cover the same classes of public service corporations within incorporated territory when it was re-enacted April 23, 1915, effective Aug. 8, 1915, so that the title "Railroad Commission," which remains unchanged, no longer signifies fully its duties and scope.

Among its various and numerous duties not the least is the exercise of complete jurisdiction over the public service companies engaged in the distribution and sale of electric energy. In this field it covers rates, service, facilities, extensions, safety of construction and operation, accounts, transfers and encumbrances of property and issues of securities.

No electric, gas, street railroad, telephone or water utility may enter a field already being served by a utility of like character unless the Railroad Commission's consent has first been secured.

The commission has power, upon petition of any municipality or other public authority, to determine the just compensation to be paid by such public authority for the whole or any part of the property of any public utility. Such finding is conclusive in eminent domain proceedings.

In all respects necessary for the protection of the consuming and investing public as well as the utility itself and its employees the commission has jurisdiction.

Work Affecting Electrical Companies

Among the specific objects affecting electric, telephone and telegraph companies which the California Railroad Commission hopes to accomplish during 1917 are the following:

The completion of its State-wide investigation into the rates, rules and regulations of each of the 400 local exchanges of the Pacific Telephone & Telegraph Company in California.

The establishment of just and reasonable rates for all electrical energy supplied in the cities of San Francisco, Sacramento, Turlock, Oakdale, Tracy and Santa Barbara. The determination of these rates will involve some very nice problems. For instance, there are three competing companies at present in the San Francisco field. From the standpoint of the cost of service, it is unlikely that any two of these will show the same results, and yet in many places all three are doing business on the same street.

A number of the large electric and gas companies have asked the commission to fix all of their rates, rules and regulations, and proceedings of this nature have been disposed of recently or are now pending in connection with the applications of the San Diego Consolidated Gas & Electric Company, the Western States Gas & Electric Company (Eureka Division), the Southern California Gas Company and the Los Angeles Gas & Electric Corporation.

Valuation in Los Angeles

In the valuation of utility properties in connection with condemnation proceedings instituted by public authorities, the commission rendered a decision only recently in the case of the City of Los Angeles against the Southern California Edison Company. The commission found $6,328,000 to be a just and reasonable compensation for property rights and lands, including an allowance of $1,578,000 for severance damages, which were defined as the reduction, caused by severance, in the value of the property not to be taken.

The attitude of the California Railroad Commission toward capital invested in utility property is clearly shown by the following quotation from this decision:

"More is involved in this proceeding than a determination of the issue between the city of Los Angeles and the Edison company. California is a young and growing State. We shall require millions of additional capital for the development of public utility enterprises. If the investor is assured that he will continue to receive fair treatment in California, he will continue to invest generously in our public utilities, even though he realizes that our cities have the prower to condemn existing public utility properties, for he will know that on such condemnation he will receive compensation which in law and in fact is a 'just compensation.' But if the State tribunals in such eminent domain proceedings make awards which are unfairly and unjustly low, so that the property is taken from its owner and given to a municipality for a sum which is less than a 'just compensation,' the investor will, of course, seek other states for his investments. On the other hand, we fully recognize the legal right of the municipalities of this State to condemn the properties of existing public utilities for compensation which shall not be unduly or unfairly high, and we deeply appreciate the tremendously important governmental policies involved in such proceedings."

In the recent decisions fixing the electric rates for the San Joaquin Light & Power Corporation, the Mount

Whitney Power & Electric Company and the Northern California Power Company, Consolidated, the commission has recognized the logic of the demand and energy form of such rates as apply to the use of electrical energy for power purposes.

The utilities involved in these cases serve the San Joaquin Valley and a part of the Sacramento Valley. These are two of the largest and most fertile districts in California. The farms therein depend for their success upon an adequate supply of water for irrigation purposes. This water is furnished partly by canal systems and partly by electrically driven pumps. In each of these three cases a rate in the following form was established for agricultural pumping service:

DEMAND CHARGE FOR VARIED MONTHS' SERVICE PER YEAR PER HORSEPOWER

One month	$4.50	Seven months	$16.40
Two months	7.50	Eight months	17.70
Three months	9.80	Nine months	18.90
Four months	11.75	Ten months	20.00
Five months	13.45	Eleven months	21.05
Six months	15.00	Twelve months	22.05

To these demand charges, which are payable in equal monthly installments, is added an energy charge of ½ cent per kilowatt-hour.

This rate, which was established for the San Joaquin Light & Power Corporation in the San Joaquin Valley, has been varied as to the amount of the charges but not as to the form in its application to the other companies, the cost of service and local conditions being different in each individual case.

The rates which were in effect at the time this investigation was instituted were nearly all on the flat-rate basis, and it was therefore necessary, for the purpose of avoiding a too abrupt change, to establish an optional flat rate for this business also, but as the consumers become educated to the advantages of the demand and energy rate it is probable that the latter will become very popular and will eventually entirely displace the former. Demand and energy rates were also established in each of these cases for industrial service, with optional schedules on a straight kilowatt-hour basis. Wherever this form of rate was put into effect a demand meter is maintained by the company which registers the average demand for the maximum fifteen-minute period during each month.

Informal Adjustment Increases Confidence

A very important department of the Railroad Commission's activities, which it hopes to develop even more in the future, is that dealing with the informal complaints which come to it by letter or orally from public utility patrons and from the utilities themselves. During the year ended June 30, 1916, more than 3000 such informal complaints were settled by the commission.

In each such instance the complainant's allegations are taken up informally with the proper officers of the utility involved, and the utility's answer is submitted with the commission's recommendations to the complainant, and, after a more or less extended discussion of this nature, in the vast majority of the cases an amicable adjustment, agreeable to all parties, is reached without the necessity of formal proceedings.

In this way the commission is able to assist in inspiring increased confidence and security in the relationship between public utilities and the public in California resulting to the benefit of the State as a whole.

RIGHTS OF HOLDING COMPANY IN A SUBSIDIARY COMPANY

Lower Court Decision in American Telephone & Telegraph Case Affecting the Controlled Central Union Telephone Company

As announced briefly in a recent issue, Judge William E. Dever of the Superior Court of Cook County, Illinois, has rendered an important opinion in the case of William A. Read and other minority stockholders against the Central Union Telephone Company, the American Telephone & Telegraph Company, the Chicago Telephone Company, the Western Electric Company, Theodore N. Vail, Union N. Bethel, B. E. Sunny, L. G. Richardson and the other directors of the Central Union Company. The Central Union Company was organized in 1883 in Illinois as a Bell subsidiary and has operated throughout Illinois, Indiana and Ohio with the exception of certain territories occupied by the Chicago, Cleveland and Cincinnati companies.

The allegations of the bill of complaint filed by the minority stockholders early in 1913 were reviewed in our issue of May 3 of that year, page 924. The immediate cause of the suit was an attempted sale of the assets and business of the Central Union Company to other subsidiaries of the Bell system at a price, which, after redeeming the indebtedness alleged to be due to the American company, would have left nothing for stockholders.

Upon the filing of the bill of complaint a temporary injunction was issued by Judge Dever restraining the proposed special meeting of stockholders of the Central Union Company and the sale of the property. Subsequently a motion for a receiver was made by the complainants. This motion was resisted by the defendants. Finally, in January, 1914, all parties consenting, the court appointed, to take over the management and control of the corporation, David R. Forgan, Frank F. Fowle and Edgar S. Bloom as receivers for Illinois. The Court of Common Pleas of Franklin County, Ohio, named the same receivers for Ohio, and the Superior Court of Marion County, Indiana, named the same receivers and also John A. Moriarity in Indiana.

Complainants contended that the stock ownership of the American company in the Union company was *per se* illegal under Illinois laws, whereas the defendants contended that it was not. The court found: "My conclusion . . . is that the purchase of the stock control of the Union company by the American company was illegal *per se* . . . first, because it violated Section 26 of the incorporation act of Illinois, and, second, because its inevitable tendency was to stifle competition and to create a monopoly."

The court next considered whether the American company acquired the stock control to promote monopoly and suppress competition. The decision goes on:

"From almost the very beginning of telephone history in this country the promoters and managers of the Bell system conceived the idea of a telephone organization doing a countrywide telephone business.

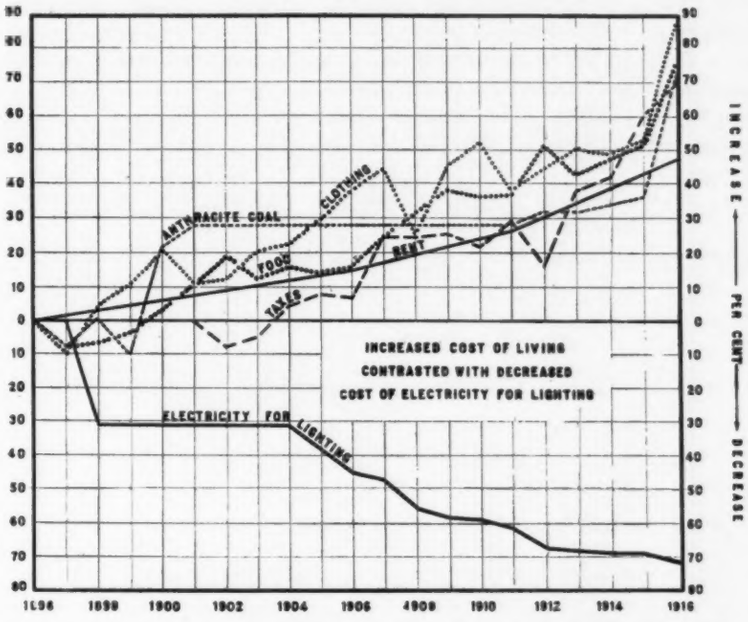
"There is no doubt that in the early history of the Bell System much of its control of the telephone business of the country was acquired by reason of its ownership of the fundamental patents, but as time passed its stock controls and sub-licensee arrangements became more and more effective and the patent right less important in maintaining its dominant position."

Mounting Costs Halt Rate Reductions

Central Station Companies Trying to Determine the Permanent Result of Higher Expenses and Taxes—European Properties Have Raised Rates

WHERE does the price of electric service stand in these strenuous times of inevitable advances in the cost of commodities and service?

Is it as a matter of business pride that the electrical industry at large continues to keep electric rates down when all other costs are creeping up day by day? Are the old low rates justified when the economical low operating costs upon which those rates were based can no longer be attained?



HOW THE CONSUMER BENEFITS—DIAGRAM OF THE COMMONWEALTH EDISON COMPANY, CHICAGO, TELLS THE STORY

Central stations are founded on the economic theory of the largest possible volume of production at the lowest possible average cost. They are the most sparing, careful users of fuel in the community, measured by the results which they obtain. Coal or oil consumption under their efficiently operated boilers yields the greatest return in applied energy to the community and is distributed by methods which assure the lowest level of cost. In short, these companies are the most important conservers of energy on an immense scale that the country holds.

Under conditions of the past, the central station companies strained every commercial resource to develop volume of business and diversity of demand. The rate was not disregarded, but it was great output at which the selling organization aimed. For output spelled lower average cost per kilowatt-hour. With the lowering of production cost there was simultaneously a decrease in the rates charged to the public users. In addition there is the tremendous influence of the tungsten lamp development and evolution, giving the public three times the amount of light without increase in rate. The full benefit of this has gone to the public.

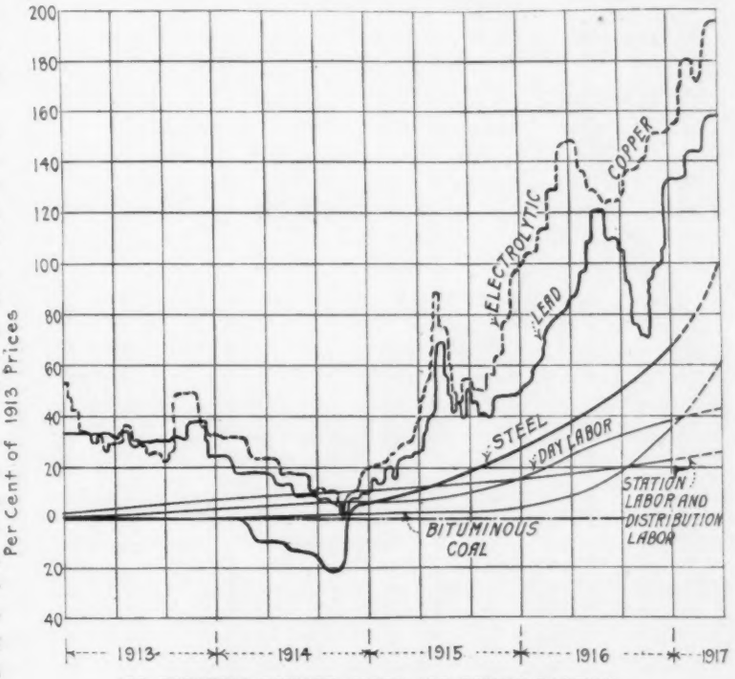
Into the steady progress in increasing production and lowering cost the 1916-17 conditions of shortage and advanced prices in material and labor have come with an explosive shock.

If the price of coal should prove to be high only for a brief abnormal period, probably the excessive operating costs of the last few months would be written down by most of the companies to experience. With a new decision to be forehanded with ample fuel supply, they would put renewed vigor into the contest for lower average operating costs.

Coal, however, only followed other commodities. Copper, steel, lead and other metals which are the raw material for apparatus and supplies antedated the coal advance in the upward price movement. Furthermore, the expenses of labor have risen so rapidly that they loom as a more and more serious factor in total cost. Taxes will be lifted by the heavier governmental outlay due to actual war.

The manufacturer who is caught by similar conditions raises his price. Unfortunately, the public utility, subject to close regulation, cannot easily do that.

In the meanwhile the tendency to reduce rates can be arrested sharply. In ending the movement for free-and-easy reductions the companies have as examples the European central station systems, which are known to have increased their rates generally. The public is reasonable. Electrical companies are entitled to a period of waiting until they can see how permanent or transient are the factors now affecting their cost accounts heavily.



ALL ELECTRIC UTILITY COSTS ARE RISING RAPIDLY

February Central Station Statistics

Earnings Total $38,900,000, an Increase of 13.4 per Cent Over February, 1916, While the Output Amounts to 1,570,000,000 Kw.-Hr., an Increase of 21.5 per Cent

THE results of central station operation, according to the regular reports received and compiled by the ELECTRICAL WORLD, continue to show the gratifying increases both in income and output which have marked the electric light and power industry now for many months. The returns from central stations having 56 per cent of the generating capacity of the entire country indicate that earnings for February last totaled $38,900,000, an increase over the previous February of 13.4 per cent, while the output amounted to 1,570,000,000 kw.-hr., an increase of 21.5 per cent. Earnings include only that revenue received from the sale of energy, while output includes only that energy from which an income was received. So far as possible intercompany activities are eliminated.

TABLE I—CENTRAL-STATION RETURNS FOR TWELVE-MONTH PERIOD

	Percentage of Industry Represented	Income from the Sale of Energy			Kw.-Hr. Output		
		1916	1915	Per Cent Increase	1916	1915	Per Cent Increase
March	65	22,027,000	18,722,000	17.8	1,212,363,000	969,888,000	25.2
April	64	21,206,000	18,375,000	15.5	1,137,602,000	920,464,000	23.1
May	64	20,345,000	17,559,000	16.0	1,170,143,000	944,681,000	24.0
June	64	20,254,000	17,551,000	15.4	1,170,679,000	968,724,000	21.0
July	64	19,760,000	17,301,000	14.2	1,174,374,000	976,704,000	24.4
Aug.	64	20,502,000	17,861,000	15.0	1,262,575,000	1,015,805,000	22.4
Sept.	64	21,432,000	18,600,000	15.2	1,268,339,000	1,037,976,000	21.2
Oct.	64	22,882,000	20,164,000	13.5	1,347,502,000	1,125,132,000	19.9
Nov.	64	24,819,000	21,744,000	14.4	1,396,537,000	1,148,221,000	21.7
Dec.	61	25,199,000	21,931,000	15.0	1,339,805,000	1,106,827,000	21.2
1917		1917	1916		1917	1916	
Jan.	63	27,090,000	23,691,000	14.4	1,480,253,000	1,167,774,000	27.0
Feb.	56	21,800,000	19,228,000	13.4	1,024,174,000	843,826,000	21.5

TABLE III—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR UNITED STATES—CITIES GROUPED BY SIZE

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
INCOME:										
Group 1	14.4	14.9	13.8	13.9	15.0	11.6	13.0	15.0	13.1	12.7
Group 2	17.5	17.7	16.8	15.7	20.4	19.2	17.7	16.9	19.4	20.0
Group 3	26.2	21.8	19.5	20.9	18.4	18.5	18.2	15.2	15.2	12.5
Group 4	15.1	11.0	9.0	9.5	11.3	13.5	12.8	12.3	15.5	10.1
Group 5	24.0	15.3	12.2	14.9	13.3	16.0	12.8	9.5	20.2	15.8
OUTPUT:										
Group 1	21.3	18.7	18.1	21.4	18.5	16.6	18.2	18.7	23.9	20.9
Group 2	18.0	17.5	22.9	33.0	32.9	31.1	27.2	21.9	36.2	24.0
Group 3	40.0	21.8	27.8	31.1	19.3	24.0	32.0	28.8	34.4	19.8
Group 4	23.0	19.3	16.1	23.0	26.0	20.4	19.7	21.0	30.5	21.8
Group 5	33.2	19.0	11.6	16.8	15.3	18.3	33.0	25.4	21.3	21.2

TABLE IV—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR NEW ENGLAND STATES—CITIES GROUPED ACCORDING TO SIZE

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
INCOME:										
Group 1	17.0	16.4	12.6	9.6	16.5	12.1	13.5	12.5	12.5	12.3
Group 2	19.5	19.8	20.6	15.1	25.5	21.3	20.0	30.2	16.1	19.9
Group 3	24.0	18.2	21.2	15.0	20.5	18.0	19.4	16.5	17.8	15.7
Group 4	13.5	7.2	6.2	11.1	10.5	15.4	16.0	16.0	22.0	13.0
Group 5	27.0	21.7	14.9	17.5	18.3	18.2	18.6	12.2	24.0	15.1
OUTPUT:										
Group 1	28.2	30.0	19.2	31.3	34.0	17.5	18.0	10.8	20.7	19.6
Group 2	33.2	26.3	14.1	32.0	37.7	35.0	24.7	18.2	24.8	19.4
Group 3	43.0	15.0	31.4	45.5	32.4	42.6	35.9	22.0	20.9	35.7
Group 4	30.0	21.0	26.6	39.4	32.9	48.9	40.0	55.2	73.8	41.5
Group 5	54.4	31.7	13.5	21.3	27.4	22.0	17.0	35.7	29.2	26.8

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

	Month	Percentage of Industry Represented	New England States			Percentage of Industry Represented	Atlantic States			Percentage of Industry Represented	Central States (Illinois Excluded)			Percentage of Industry Represented	Pacific and Mountain States		
			1916	1915	Per Cent Increase		1916	1915	Per Cent Increase		1916	1915	Per Cent Increase		1916	1915	Per Cent Increase
INCOME	March	66	2,595,000	2,122,000	22.0	67	8,998,000	7,660,000	17.5	57	6,470,000	5,394,000	20.1	88	3,787,000	3,386,000	11.9
	April	64	2,221,000	1,898,000	17.0	67	8,794,000	7,596,000	15.8	56	6,289,000	5,292,000	19.0	88	3,825,000	3,520,000	8.8
	May	65	2,103,000	1,788,000	17.0	67	8,226,000	7,131,000	15.4	56	6,085,000	5,123,000	18.7	88	3,874,000	3,469,000	11.6
	June	65	2,208,000	1,906,000	16.0	67	8,045,000	6,905,000	16.5	56	6,007,000	5,143,000	16.9	88	4,017,000	3,539,000	13.5
	July	65	2,130,000	1,875,000	13.7	67	7,832,000	6,621,000	16.4	56	5,926,000	5,095,000	16.3	88	3,755,000	3,493,000	7.6
	August	65	2,203,000	1,935,000	13.7	66	8,000,000	6,875,000	16.4	56	6,195,000	5,266,000	17.7	88	3,883,000	3,582,000	8.4
	September	65	2,315,000	1,982,000	16.8	66	8,631,000	7,445,000	16.0	56	6,505,000	5,537,000	17.8	88	3,979,000	3,644,000	9.2
	October	65	2,684,000	2,331,000	15.2	65	8,887,000	7,930,000	12.1	56	6,968,000	5,895,000	18.2	87	4,213,000	3,889,000	8.3
	November	65	2,912,000	2,516,000	15.7	65	10,061,000	8,859,000	13.5	56	7,410,000	6,313,000	17.4	87	4,246,000	3,947,000	7.5
	December	65	3,203,000	2,814,000	14.0	66	11,059,000	9,348,000	19.6	56	7,791,000	6,899,000	12.9	75	2,987,000	2,735,000	9.3
	1917		1917	1916			1917	1916			1917	1916			1917	1916	
	January	64	3,181,000	2,762,000	15.1	66	11,400,000	9,874,000	15.6	55	7,763,000	6,735,000	15.3	86	4,602,000	4,208,000	9.5
	February	63	2,932,000	2,587,000	13.3	65	10,200,000	8,979,000	13.7	40	5,156,000	4,517,000	14.3	74	3,351,000	3,012,000	11.4
			1916	1915			1916	1915			1916	1915			1916	1915	
KW.-HR. OUTPUT	March	66	97,321,000	74,958,000	29.9	67	439,660,000	349,347,000	26.0	57	360,872,000	282,179,000	28.0	88	304,327,000	255,450,000	19.3
	April	64	84,769,000	64,816,000	30.8	67	403,223,000	326,574,000	23.4	56	344,866,000	273,367,000	26.4	88	302,386,000	253,778,000	19.2
	May	65	84,719,000	64,318,000	31.8	67	409,529,000	333,585,000	22.0	56	345,860,000	275,328,000	25.6	88	328,793,000	266,599,000	23.2
	June	65	87,829,000	69,506,000	27.6	67	396,630,000	327,541,000	21.2	56	350,015,000	288,982,000	21.2	88	328,996,000	277,915,000	18.6
	July	65	85,317,000	71,160,000	19.8	67	401,179,000	333,771,000	20.3	56	350,708,000	287,407,000	22.2	88	325,647,000	279,285,000	17.4
	August	65	97,197,000	72,900,000	33.4	66	433,129,000	344,730,000	25.7	56	374,327,000	295,866,000	26.5	88	333,468,000	279,976,000	19.1
	September	65	98,350,000	73,343,000	34.2	66	446,534,000	369,815,000	20.8	56	387,626,000	307,485,000	26.2	88	335,817,000	288,332,000	16.4
	October	65	107,756,000	83,705,000	28.8	65	426,151,000	373,705,000	14.2	56	408,364,000	324,509,000	25.9	87	355,014,000	306,828,000	15.8
	November	65	111,873,000	89,015,000	25.7	65	533,252,000	424,746,000	25.6	56	415,491,000	334,044,000	24.4	87	346,847,000	293,518,000	18.2
	December	65	117,763,000	97,387,000	21.0	66	535,410,000	444,923,000	20.4	56	419,532,000	348,815,000	20.2	75	256,006,000	206,838,000	23.8
	1917		1917	1916			1917	1916			1917	1916			1917	1916	
	January	64	120,211,000	93,163,000	29.1	66	564,699,000	429,432,000	31.5	55	422,347,000	338,225,000	25.0	86	363,094,000	298,990,000	21.4
	February	63	106,328,000	84,992,000	25.3	65	416,714,000	240,724,000	22.0	40	225,318,000	194,125,000	16.1	74	264,319,000	215,399,000	22.9

With the exception of the Pacific Coast and Mountain States, the results from operation did not show up so well in February last compared with February, 1916, as they did in January last compared with January, 1916. Especially is this true for output, the increase in which, while large, was not so large as the January increase. However, the output for February, 1916, was especially large, and for that reason the comparison with February last would not make such a favorable showing. In addition, there was a slowing down in February of some of the major industries of the country which in previous months had been working at capacity rate. Many munition factories had completed contracts and had shut down temporarily. It is further noticed that in the zinc-mining region the output in February fell off considerably. In the copper-mining region there was a similar falling off, but here it was undoubtedly due to a large extent to weather conditions, which caused mining operations to be curtailed to a considerable extent.

Industrial operations had slowed down to a much greater extent than is evidenced by the figures for February. Besides those industries already mentioned other industries were affected by the labor situation, but principally by raw materials, the scarcity of which caused a lessening in production. That this condition is not more evidenced in the accompanying figures is undoubtedly due to the increased or new load that many plants have taken on. A shortage in coal brought to the central stations a large industrial load that otherwise would not have been on the lines, at least for some time.

Generally speaking, cities in the group having a population between 50,000 and 100,000 inhabitants showed the greatest increases in operations for February last over February, 1916. In the remainder of the country the increases from operations were approximately the same.

Decreases in rates which were put into effect in a number of cities at the beginning of the new year, of course, have tended to make the increase in February, 1917, over February, 1916, somewhat less in income than it would have been had rates remained the same.

TABLE V—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR ATLANTIC STATES—CITIES GROUPED BY SIZE

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
INCOME:										
Group 1	14.5	16.4	16.8	16.1	16.2	10.7	13.7	18.8	15.0	13.0
Group 2	21.7	21.9	18.5	21.6	19.0	21.0	22.5	21.7	28.3	27.3
Group 3	17.7	12.0	14.2	15.0	14.0	14.6	13.0	13.4	12.5	10.4
Group 4	14.0	15.4	10.0	14.4	9.8	13.5	13.1	14.4	14.0	11.0
Group 5	13.0	15.2	13.0	19.4	8.9	14.3	16.0	14.3	11.1	11.8
OUTPUT:										
Group 1	25.5	13.1	23.4	28.5	23.6	19.2	20.8	21.5	32.5	22.0
Group 2	11.3	31.8	27.4	32.5	26.7	33.0	31.9	28.2	42.6	31.2
Group 3	18.0	13.2	11.5	16.0	24.7	4.5	19.0	15.9	27.2	21.2
Group 4	12.6	19.7	16.3	29.5	18.6	17.5	14.6	16.0	25.4	17.0
Group 5	35.0	11.1	13.5	20.4	1.3	1.5	5.8	6.9	9.4	17.0

TABLE VI—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR CENTRAL STATES—CITIES GROUPED BY SIZE

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
INCOME:										
Group 1	18.0	16.4	15.8	16.5	16.6	18.0	16.5	13.0	15.5	14.0
Group 2	17.4	17.5	17.3	21.8	21.5	21.0	17.0	16.4	18.0	18.7
Group 3	27.2	20.5	18.6	18.4	13.4	10.9	13.0	1.8	6.0	0.5
Group 4	24.1	17.5	17.5	10.7	20.0	19.7	16.8	15.5	19.8	19.6
Group 5	21.3	12.6	6.1	11.8	11.0	18.4	14.3	†	19.3	16.7
OUTPUT:										
Group 1	25.0	23.8	21.0	24.3	22.3	24.9	24.8	22.3	25.3	22.7
Group 2	19.5	12.3	25.7	36.4	40.0	31.7	29.7	21.0	31.0	23.6
Group 3	41.0	31.8	26.0	25.7	20.7	17.3	19.7	1.2	5.8	30.0*
Group 4	38.5	34.3	21.1	23.0	33.8	26.1	21.2	21.4	24.5	23.2
Group 5	14.7	4.0	8.6	6.1	13.7	28.2	16.8	9.9	15.5	17.1

*Decrease.
†Results omitted owing to insufficient returns.

TABLE VII—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR PACIFIC AND MOUNTAIN STATES—CITIES GROUPED ACCORDING TO SIZE

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan	Feb.
INCOME:										
Group 1	7.2	7.5	4.7	5.5	6.2	4.2	4.5	4.0	5.4	10.0
Group 2	2.3	1.2	0.6*	0.7	4.9	1.3	3.0	3.6	7.5	5.5
Group 3	39.0	39.5	28.3	32.5	28.5	32.4	31.0	30.0	27.6	23.5
Group 4	13.8	3.6	1.0	0.5	11.5	7.2	0.4	0.6*	8.6	1.8
Group 5	19.1	12.8	13.2	13.0	11.7	13.5	17.1	11.1	20.3	13.0
OUTPUT:										
Group 1	12.0	8.0	10.0	6.3	7.1	5.2	8.0	8.6	11.0	17.8
Group 2	2.2	1.0	2.0	6.5	7.8	9.7	11.4	8.7	11.8	16.2
Group 3	79.0	74.5	56.1	57.5	60.0	63.7	61.3	48.0	59.5	36.8
Group 4	21.8	10.0	4.0	7.5	12.0	*0.5	4.2	2.6	15.2	14.0
Group 5	17.5	16.0	10.8	16.5	7.0	14.7	42.3	5.4	19.1	8.0

*Decrease.

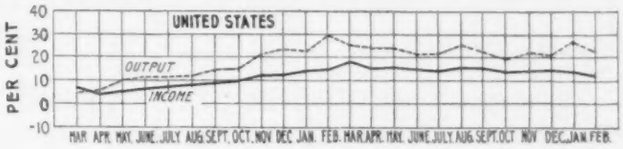
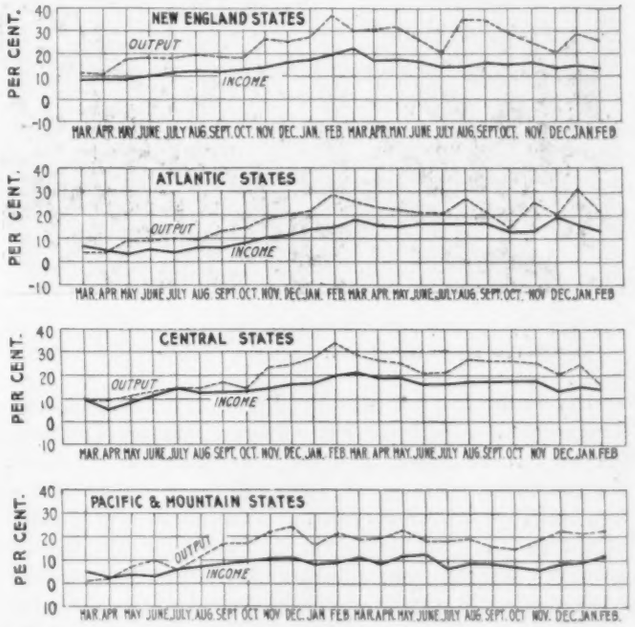


FIG. 1—CENTRAL STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT FOR UNITED STATES

GRAPHIC REPRESENTATION OF GROWTH

The accompanying curves show graphically the percentages of increase in income and output as contained in Tables I and II. The remaining tables show the increases in per cent in income and output grouped in companies according to the size of the community served. Group 1 includes those companies operating in cities with a population of over 100,000 inhabitants; group 2 includes those companies operating in cities with a population between 50,000 and 100,000; group 3 in cities between 25,000 and 50,000; group 4 between 10,000 and 25,000, and group 5 between 5000 and 10,000 inhabitants.



FIGS. 2 TO 5—CENTRAL STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT SECTIONALLY

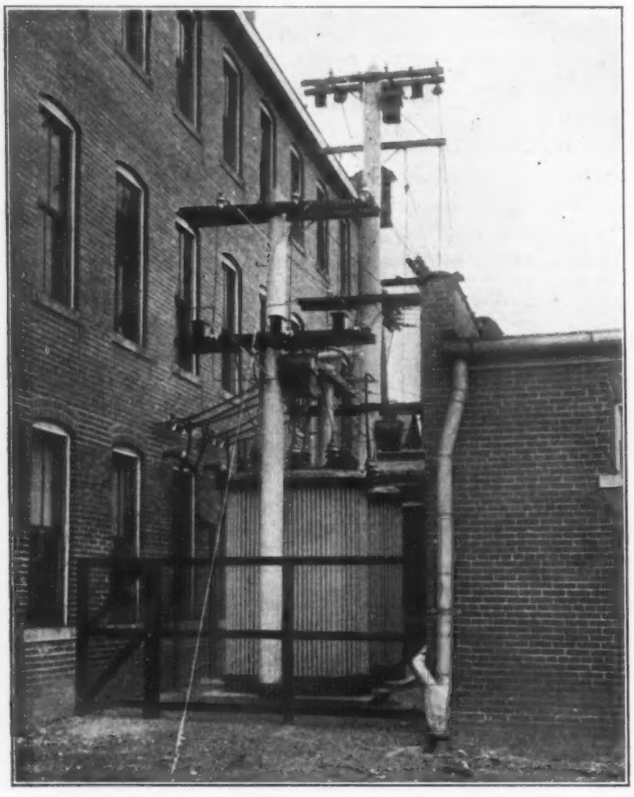
STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

COMPACT OUTDOOR SUBSTATION

Transforming, Switching, Metering and Protective Equipment Serving Ohio Industrial Plant

Shown in the accompanying illustration is an outdoor transformer station which is particularly well equipped, arranged and protected for an industrial plant station. It serves the Godman Shoe Company, Lancaster, Ohio,



TWO 500-KW. THREE-PHASE TRANSFORMERS AND METERING AND PROTECTIVE EQUIPMENT FOR SMALL FACTORY SUBSTATION

and is on the lines of the Ohio Light & Power Company. The station consists of two General Electric Company 500-kw., three-phase, 60-cycle, 2300/440-volt, oil-cooled transformers on concrete foundations, and two 50-kw. and one 75-kw. unit behind the units in the foreground of the picture. These units, with the poles which support the wiring, the metering devices and protective equipment, are located outside the plant of the shoe company in a 14-ft. by 30-ft. (4.3-m. by 9.1-m.) space between the buildings. This outside location was chosen because it was not valuable for other purposes and because it was considered safer not to take the higher potential into the factory building.

The primary leads to the station are taken from an adjacent power circuit. These leads are supported on strain insulators rather than pin-type insulators, because it is the practice of this company to dead-end primary lines on strain insulators rather than on wood pins, owing to the fact that pins as a rule rot out in a short time and this method makes a safer and more lasting installation. The leads then pass through a type P-7 General Electric oil switch, by means of which the entire installation can be disconnected from the lines. From this switch the primary leads drop to a three-wire bus stretched between the top arm of the short pole and the third arm of the high pole. Connections between the primary leads of each 500-kw. transformer and this bus are made through two P-7 oil switches, so that either unit can be "killed" under load without affecting the operation of the other. Expulsion-type fuses are also installed in the primary leads just ahead of these two oil switches to afford protection against lightning and short-circuits on the lines. The secondary leads are arranged in a sightly fashion by placing two secondary cable buses between the wall and a stub pole and then dropping from these buses to the conduit entrance with the heavy secondary lines.

This installation is metered both on the high-tension and low-tension side. The customer pays for energy metered on the secondary side. But in order to secure accurate comparative data on high-tension and low-tension metering, the company has installed potential and current transformers in the roofed box near the top of the high pole and meters the energy also on the high-tension side. A watt-hour meter and a maximum-demand meter used for this service are installed in a box just behind the transformers at a height which makes it convenient for a man to look into the box. The leads from the current transformers to the meters are inclosed in conduit.

DUSTING OF CONCRETE

Objection in Power Plants—Contributing Causes and How Floors in Service May Be Treated

Freedom from dust, especially dust of a coarse, gritty nature, is desirable around any air-cooled apparatus, but is almost imperative where rotating machines are installed. Dusting of concrete floors is frequently a great source of trouble. Usually it is caused by too fine, dirty or otherwise unsuitable sand in the concrete; by too little cement in the mixture; by too much time being allowed to elapse between mixing and finishing; by troweling to finish while too wet or troweling at several intervals after hardening has commenced, and thus breaking up the process of crystallization of the cement in setting; by the use of dryers; and finally, by permitting the surface to dry out too rapidly after completion.

Floors that are already in service and are giving trouble from dusting can be treated by one of several methods to remove the defect, although such treatments, being in the nature of surface applications, may require renewing from time to time as a result of wear. One palliative treatment that has been used with consid-

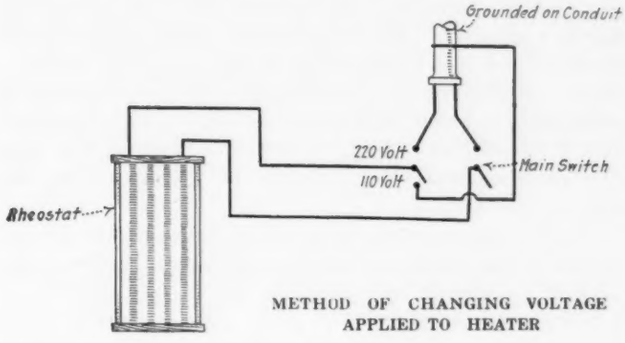
erable success consists of a mixture of turpentine and boiled linseed oil, combined in such proportions as readily to be absorbed by the floor surface. This preparation, however, is suited only to old or thoroughly cured concrete, and will somewhat darken the color of the floor. Several paint manufacturers have brought out, under such names as "floor surfacers" and "floor fillers," paints that temporarily suppress dusting, but such applications also will need renewal from time to time as the surface wears off.

CONSTRUCTION OF HEATER FOR SUBSTATION OFFICE

Heater Made from Telegraph Wire and Switching Arrangements for Operating It at Either of Two Voltages

Electrical energy has superseded steam heating at the Plum Street substation of the Cumberland County Power & Light Company, Portland, Me. A home-made heater is used in the office. It consists of helicos of No. 13 galvanized-iron telegraph wire stretched between two 8-in. (20.3-cm.) by 12-in. (30.5-cm.) slate slabs held 30 in. (91.4 cm.) apart by ½-in. (12.7-mm.) pipe spacers mounted on ¼-in. (6.4-mm.) rods. At 220 volts the heater requires 25 amp.,* but in mild weather it is operated at 110 volts, changes in the connections being permitted by the switching arrangements shown in the accompanying sketch. A double-throw, single-pole switch enables the transfer from one voltage to the other to be made readily.

The heater, it has been ascertained, effectively warms



METHOD OF CHANGING VOLTAGE APPLIED TO HEATER

an office 20 ft. 6 in. (6.25 m.) long, 12 ft. 6 in. (3.81 m.) wide and 14 ft. (4.27 m.) high, with three windows and a northeasterly exposure.

Method of Fusing Transformers

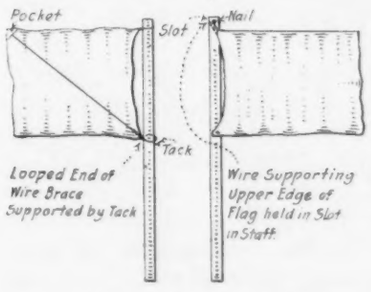
An unusual method of fusing 2300-volt pole-type transformers has been devised by W. T. Wells, superintendent of the Kingsport (Tenn.) Light & Power Company. In the fuse block which is at the lineman's right hand when he climbs the pole on the side opposite the transformer is placed a fuse which is slightly smaller than the other or others, as the case may be. As most fuses are blown by small overloads, only the lower-rated fuse is ruptured with this arrangement. Thus it is unnecessary for a lineman to test both fuses where restoring service, and considerable time is saved.

*Safe carrying capacity of No. 13 iron wire is 12.5 amp.

DANGER SIGNALS

Two Methods of Making Warning Flags Conspicuous —Both Methods Involve Wire Brace

Instead of tacking red flags to staffs, one large Middle West central station company attaches each flag to a wire and then attaches the wire to the staff. The method of fastening the wire to the flagstaff is shown on the left of the accompanying illustration. A slit is sawn longitudinally in the top of the staff and an eye in the wire is held in the slit by means of a stove bolt. The wire is then bent so that it forms a self-supporting arm when extended in one direction from the staff and lies longitudinally along the staff when it is thrown over in the other direction.



METHODS OF HOLDING WARNING FLAGS EXTENDED

With this arrangement a flag can be made to remain fully extended when in use and for transportation can be packed into practically as small space as an ordinary flag.

A different method of extending warning flags, used by an Eastern company, is also illustrated herewith. In this case the flag is tacked to the staff, but is held extended by a wire looped around the staff near the lower fixed corner of the flag and projecting diagonally across the flag to the outer upper corner where it fits into a pocket in the flag. The lower end of the wire brace is prevented from sliding down the staff by a tack. This flag can also be rolled up when desired by folding the wire brace up against the staff.

HIGH-TENSION OUTDOOR METERING

Method of Protecting Apparatus Used for This Service from Weather and Temperature Changes

BY ADRIAN TOBIAS

Superintendent Meter Department, Mahoning & Shenango Railway & Light Company, Youngstown, Ohio.

During the past few years distribution of electrical energy to large power users at high voltages and over long distances has become the rule. The greater portion of this energy is measured on the high-tension side of distributing transformers and on a demand basis. Furthermore, the drift of modern distribution engineering is decidedly toward completely operated outdoor substations. This arrangement presumes the location of necessary current and potential transformers, including demand apparatus and possibly a power-factor meter in an outdoor location. But simply to make use of instrument transformers designed for outdoor use and then house the demand meter in an ordinary weatherproof box will not accomplish the results desired under extreme weather conditions. This is particularly true just now when there are from six to ten torsion springs, several contact surfaces and a complicated gear mechanism evident in demand devices in use. All of these parts are susceptible to variations in temperature, which will seriously affect the indications of demand.

In Youngstown, Ohio, we are attempting, therefore, to solve the problem of protecting demand meters and controlling temperature variation by providing specially constructed outdoor boxes. They are made of 1-in. (2.54-cm.) lumber in the rough, then covered with heavy tarred felt paper. Over the paper is laid 3-in. (7.62-cm.) straight-grained, yellow-pine flooring. The door is made like a refrigerator or cold-storage door, by extending the flooring for about 1 in. (2.54 cm.) over the dimensions of the rough door. For installations up to 400 kw. inside measurements should be about 30 in. by 36 in. (76.2 cm. by 91.4 cm.) with a depth of 10 in. (25.4 cm.).

Inside the box current transformers are mounted at the top and on each side with the two potential transformers between them. Porcelain tubes are used for the lead-in wires. The demand meter is mounted at the bottom of the box. To provide ventilation, two holes, 2.5 in. (6.35 cm.) in diameter, are made in both sides of the box near the top; two holes of the same dimensions are also made in the bottom of the box on either side of the demand meter. These holes are covered with screen cloth on the outside. Two-inch (5.08-cm.) galvanized sheet-iron louvers keep the rain out of the ventilating holes at the top.

In cold weather all or part of the openings are closed, thus making use of the heat given off by the transformers in keeping up the temperature on the inside of the box. Heat given off from transformers is not sufficient for this purpose, however, when the outside temperature falls much below freezing. For extreme weather conditions a 25-watt frosted lamp is inserted on the secondary of each potential transformer. One or both of these lamps are backed out of sockets as weather moderates. By increasing the size of the box to 30 in. by 48 in. by 10 in. (76.2 cm. by 121.9 cm. by 25.4 cm.) sufficient equipment to take care of a 2000-kw. load, including a power-factor meter, can be easily provided for.

COST OF OPERATING PRODUCER-GAS PLANT

Output Amounting to 133,314 Kw.-hr. Yearly Produced at Cost of 4.6 Cents per Kw.-hr. in South Dakota Plant

As an example of the cost of furnishing electric service from a producer-gas-engine plant in a town of 1500 people, the following data were recently submitted by Earl D. Jackson, consulting engineer, St. Paul, Minn. The installation, which is at Elk Point, S. D., consists of two Smith gas producers and two 50-kw. Foos gas engines. For the year 1916 the total output of the plant was 133,314 kw.-hr. The station expenses were as follows:

COST OF OPERATION IN PRODUCER-GAS PLANT

Coal	$1,131.07
Salaries, two operators and one-half superintendent's time	2,200.00
Insurance	73.00
Lubricating oil	121.60
Gasoline	65.10
Repairs, tools, waste, etc	349.66
Interest at 5 per cent on station investment	1,000.00
Depreciation at 6 per cent	1,200.00
Total	$6,140.43
Cost per kilowatt hour (cents)	4.6

COST OF TREATING POLES

Data on Butt Treatment of Wooden Poles by Open-Tank Process and Added Life Gained Thereby

According to A. B. Campbell of Ames, Iowa, open-tank treatments of wooden poles have been found more expensive than the brush methods, but it should be kept in mind that a deeper penetration is secured when poles receive these treatments. One operating company reports the cost of treating by the open-tank process with semi-portable equipment at 75 cents per pole. In this case the butts are submerged in hot carbolineum twenty to thirty minutes and then dipped in cold carbolineum for two minutes. The tank in which the hot treatment is given is 5 ft. (1.5 m.) in diameter and 9 ft. (2.7 m.) high. Ten poles are treated at one time. The cold treatment is given in a tank 3 ft (0.9 m.) in diameter and 9 ft. (2.7 m.) high. Each pole is given the cold treatment separately. The poles are distributed by the use of auto trucks.

TABLE I—COST OF BUTT-TREATING WOODEN POLES WITH OPEN-TANK METHOD

	Size of Pole						
Top (in.)	5	5	6	6	7	6	7
Length (ft.)	20	25	25	30	30	35	35
Price of pole f.o.b. common points in Iowa and Illinois rate of freight	$0.90	$1.28	$2.25	$3.90	$5.35	$5.85	$9.15
Cost of putting in line including shaving, but exclusive of painting and stepping	0.72	1.54	1.54	2.17	2.17	3.38	3.38
Total cost in line	$1.62	$2.82	$3.79	$6.07	$7.52	$9.23	$12.53
Using U. S. average twelve years' life.—Per annum cost of pole in line	0.135	0.235	0.315	0.505	0.626	0.769	1.04
Cost of butt treatment according to specification A	0.45	0.55	0.90	1.10	1.25	1.35	1.50
Cost of butt treatment according to specification AA	0.35	0.40	0.70	0.85	1.00	1.05	1.20
Cost of butt treatment according to specification B	...	...	1.30	1.85	1.95	2.05	2.35
	Number of years added life necessary to pay entire cost of treatment						
Specification A	3.30	2.34	2.85	2.17	2.00	1.75	1.44
Specification AA	2.59	1.70	2.27	1.68	1.60	1.36	1.15
Specification B	...	...	4.12	3.70	3.12	2.66	2.26

Table I, issued by the Page & Hill Company of Minneapolis, shows the cost of Northern white cedar poles, cost of butt treatment by open-tank process, annual maintenance expense of poles in line, and number of years added life necessary to pay entire cost of treatment. The prices given are f.o.b. Iowa and Illinois common points. No specific data are available as to the number of years which may be added to the life of poles through treating, but reports on inspections made on the Warren-Buffalo and Newton-Poughkeepsie lines of the American Telephone & Telegraph Company are summarized in Table II.

TABLE II—EFFECT OF BUTT TREATMENT ON LIFE OF POLES*

Method of Treatment	Reduction in Circumference at Ground Line After Five Years of Service	Average Percentage of Poles Showing Decay After Eight Years of Service
Tank treated with creosote	Not noticeable	1.5
Tank treated with zinc chloride	.....	59
Brush treated with creosote	0.06 inch	45
Brush treated with carbolineum	0.09 inch	47
Untreated	1.03 inch	100

*Information obtained from the Page & Hill Company, Minneapolis.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

JUSTIFICATION FOR THE ELECTRIC COOKING RATE

Why Electric Range Customers Can Obtain Energy at a Lower Unit Price Than Small Power Users

The question "How shall we justify an electric range rate that gives residence customers energy at a lower unit price than small power users?" was asked at the recent Minnesota Electrical Association's convention. The manager who asked the question stated that he had plenty of plant capacity available and that he was able to produce energy at a cost which would justify a 3-cent cooking rate, but that he hesitated to inaugurate such a rate for fear of its effect on the small power customers in view of his own inability to explain the justice of it.

The reply to the query was made by H. E. Young, sales manager of the Minneapolis General Electric Company, who said: "The reason the electric range load can be served at a lower unit cost than the small power load is that it costs the producer less for the former service. Under the conditions specified the generating capacity, a large part of the distribution system and perhaps even the meter necessary for serving the range installation are already a part of the existing permanent investment. The chances are also that the prospective range customer is now a lighting customer, and the addition of the range in the home will not increase the existing consumer costs. This is not true of the small power customer as a rule. Moreover, the load produced by the small power customer is probably an on-peak load, whereas it has been demonstrated that the electric range load is coincident with the system peak only 10 per cent of the time."

THE COMMONWEALTH EDISON CONTEMPLATES SALES SCHOOL

To Instruct Salespeople in Manufacture and Operation of Appliances, in Sales Methods, and General Company Policies

In a discussion presented by Ernest A. Edkins, general manager of the Electric Shops, before the new-business co-operation committee of the Illinois State Electric Association at Peoria, Ill., April 27, it was pointed out that, contingent upon the authorization of the plan by the company's executives, the Commonwealth Edison Company would inaugurate a school for its sales staff. This course of study will include lessons in construction and operation of appliances, in sales methods, in decorative periods and styles as applied to portable lamps, shades, etc., in interdepartmental relations and in general company policies.

The course will probably be carried on with daily classes, and every one in the sales department will be obliged to spend approximately one hour each day in these classes, which will be conducted along the same general lines as a regular school, with prescribed lessons and periodic examinations to determine the progress of the students. A similar plan is now about to be put into effect in the Baltimore (Md.) company, and both of these plans are directly in line with the other developments in commercial engineering and salesmanship courses now being carried on in the National Electric Light Association under the supervision of the Commercial Section.

"I firmly believe," said Mr. Edkins, "that such courses of study intelligently directed will very soon result in doubling the efficiency of the sales force and will pay big dividends on the modest investment required to carry on the course."

POOR UPKEEP THE PRACTICE AS REGARDS ELECTRIC SIGNS

Investigation Shows That Only 10 Per Cent of Signs Operated in One of the Larger Cities Had Every Socket Equipped with a Good Lamp

Electric signs all alight and with every lamp burning look well and speak for progress; but when a sign every here and there shows a few lamps not burning, then the effect is one of shabbiness and backwardness. Signs that by night look as though the mice had got into them and chewed out a part of a letter here and a chunk somewhere else are not assets to the owner and certainly do not help the central station in increasing its sign load.

An investigation recently conducted showed that of 200-odd electric signs which were investigated one-third were not being burned at all, and only about 10 per cent of those which were in operation had every socket equipped with a good lamp. A surprisingly large percentage of the owners apparently knew nothing about the poor condition of their signs.

The investigation covered a survey of practically all of the electric signs in one of the larger cities of the country, except those signs of large hotels, department stores, etc., whose lamp requirements were known to be covered by a lamp contract. In a total of 229 signs, over 30 per cent were entirely unlighted at night and about 47 per cent had six or more burned-out lamps. The owners in this last-named class were interviewed in an effort to have the necessary lamp renewals made, with the result that practically all decided to put in new lamps and many decided to repaint their signs at the same time. The renewals averaged sixteen lamps per sign. The results of this investigation may be taken generally as representative of conditions obtaining in the large cities; in smaller cities and towns it is doubtful if conditions are much better.

On one of the largest department stores in the East a few nights ago every sign—and this store has about ten electric signs—had one or more lamps out, and the

largest sign of all had one of its five letters entirely out. The largest sign in one of the oldest suburban cities outside of New York City, a sign that meets the eye of every person entering that town, never has all of its lamps burning. The effect of that sign on a prospective sign purchaser is certainly not encouraging.

There is an opportunity for much co-operation between central stations and sign owners. Electric signs are advertisements—if they are not good advertisements their use cannot be justified—and their value to their owners is dependent upon the impression they give to the passerby. The average store manager is very willing to take steps to renew lamps and have his sign put in order if his attention is called to the advantages and necessity for so doing—the investigation strongly confirms this statement. The trouble most often lies in the fact that few owners or managers view their signs at night. The revenue of the central station would be increased on a very desirable class of long-hour business were an effort made to have every socket in every sign equipped with a good lamp and the sign used consistently.

Besides, there is another point of view that the central station should not lose sight of. Operating expenses have reached such a point that it is absolutely necessary to increase output. The sign load is by no means insignificant, and as a matter of good economy it would seem advisable to get the maximum output from this load. The loss in revenue from signs that are not burning, or burning in part only, amounts to a considerable sum in the course of a year. As a means therefore of increasing revenue without increasing generating capacity it would be to the best interests of central stations to see that all signs burn every night and that every socket is in nightly operation.

THE PUBLIC SERVICE MAN IN CIVIC LIFE

What One Ohio Sales Manager Thinks About the Advantages That Accrue to the Utility Which Has Its Executives in Prominent Local Circles

At one of the meetings of the new-business men of the Ohio Electric Light Association O. A. Acuff, sales manager of the Massillon (Ohio) Electric & Gas Company, presented a brief discussion expressing his belief that every salesman should interest himself in the civic life of his city. At the request of a representative of the ELECTRICAL WORLD, Mr. Acuff elaborated on that idea more fully in a letter setting forth what has been accomplished along this line at Massillon. This letter contains so much food for thought on the part of the utility manager who is inactive locally that it is published practically in full herewith.

"Without wishing to appear egotistical," writes Mr. Acuff, "I may point out that the writer is president of the Massillon Advertising Club, vice-president of the Rotary Club of Massillon, chairman of the advertising committee of the Chamber of Commerce, and a member of the executive committee of Massillon's annual industrial show. T. O. Kennedy, general manager of the Massillon Electric & Gas Company, is a director of the Chamber of Commerce, a member of the industrial show's executive committee, secretary of the Massillon Club and chairman of the new industries committee of the Chamber of Commerce. This shows to what extent we believe it is necessary to be leaders in an active community.

"The Massillon Advertising Club is composed mostly of retail merchants. The president of this club necessarily represents a retail establishment. The average central station organization is considered a soulless body of men whose sole object is to extract dollars from a community. The general public does not recognize it as a retailer, or a business institution doing a legitimate retail business, unless it is proved to them that it is such. The general public is 'from Missouri.' We have succeeded here in proving to the majority of Massillon citizens that the Massillon Electric & Gas Company is an Ohio corporation, a Massillon taxpayer, a necessity to the community, and a retail establishment to which are due the respect and confidence of the people. We have made our public feel that our employees are folks with souls and folks who are Massillon boosters.

"The Massillon Rotary Club is a representative body of live business men who are doing things. It is, I believe, quite an honor to be an executive in this club. The Massillon Club is the manufacturers' club. This also is a select club and is too expensive for other than manufacturers who are at the top.

Business and Civic Connections Compel Recognition

"The business and civic connections of our executives, therefore, compel recognition in the event that we who are active in this work conduct ourselves properly. The positions in these clubs or organizations have come unsolicited. The individuals with this company have been elected by the members of these different organizations as their representatives. It has been said here that a man from the electric light company on the board of control of these clubs is a necessity, as it affords the club corporation ideas or viewpoints. The business men feel that the corporation view is the broader view.

"As the result of the efforts of the company's executives in these civic organizations, a condition has been created wherein a new industry locating in Massillon cannot do otherwise than buy power from the company. The industries here have had it drilled into them through contact that they cannot afford to operate a power plant.

Public Activity Valuable in Securing Lighting Contract

"Our merchants have placed great confidence in us. They depend on us for support, and when we asked the city for a new ten-year street-lighting contract not a word was said against its being granted. In fact, our friends in the business section of the city petitioned the Council to grant us the contract without the consideration of other bids than our own.

"The citizens in general have come to know from acquaintance with us that we are human. They have learned to recognize that we have souls and have brains which produce constructive ideas. I believe our association with the civic and commercial bodies of Massillon should be credited with the company's wonderful increase in revenue last year, which amounted to 50 per cent.

"In addition to this it is certainly a pleasure to be able to walk the streets of this city as a representative of a two-million-dollar corporation and be called by

your first name and to receive a friendly slap on the back from the best people in the city—those who are really doing things."

FOUR AND A HALF YEARS OF BATTERY EXCHANGE

Detailed Figures Showing Monthly Operation of System at Hartford Since It Was First Started

Detailed figures showing the monthly operation since its beginning of the battery exchange system of the Hartford Electric Light Company are shown in the accompanying table. Further information concerning this system will be found in the April 28 issue of the ELECTRICAL WORLD, where it is fully described. The battery exchange system in Hartford began, it will be noted in the table, with eighteen cars in June, 1912, and in January, 1917, the latest month for which operating figures are obtainable, there were eighty-six cars using the exchange service. Since that time other cars have been added.

A careful study of the table will reveal that on the average 1.4 batteries are needed per car. It will also be noticed that the average of car miles per month was in the neighborhood of 6700. The lighter cars, however, had a better mileage record than the heavier cars. On the total mileage of the system, the highest month was October of last year, when 56,402 miles were run off. The energy consumption, however, was highest in December last, when this figure reached the total of 83,258 kw.-hr.

The energy consumption per car mile was between 1 kw.-hr. and 2 kw.-hr., while the energy consumption per rated ton-mile was on an average 1.3 kw.-hr. Early figures for energy consumption appear to present a discrepancy, but the reason for this was that some of the cars were formerly on a different system and it took some time to change over all the cars to the battery exchange system. For this time the records are not sufficiently clear.

MONTHLY OPERATING DETAILS OF HARTFORD BATTERY EXCHANGE SYSTEM

	Total Cars	Total Batteries	750-Lb.		1000-Lb.		2000-Lb.		2-Ton		3½-Ton		Car Miles per Month						Total Miles	Kw.-hr. per Month	Kw.-hr. per Car Mile	Kw.-hr. per Rated Ton Mile
			Trucks	Batteries	Trucks	Batteries	Trucks	Batteries	Trucks	Batteries	Trucks	Batteries	Total	750-Lb.	1000-Lb.	2000-Lb.	2-Ton	3½-Ton				
June 12	18	4	7	2	6	....	5	2	.....	.....	.....	.....	655	817	582	509	.....	.....	11,757	668	0.058	0.098
July 12	18	5	7	2	6	....	5	3	.....	.....	.....	.....	587	664	588	471	.....	.....	10,530	818	0.078	0.134
August 12	19	5	7	2	6	....	6	3	.....	.....	.....	.....	653	720	681	542	.....	.....	12,381	1,630	0.132	0.215
September 12	19	5	7	2	6	....	6	3	.....	.....	.....	.....	645	679	584	662	.....	.....	12,224	2,610	0.213	0.349
October 12	21	7	8	3	6	1	7	3	.....	.....	.....	.....	707	799	676	627	.....	.....	14,839	4,084	0.275	0.445
November 12	25	8	8	3	9	1	8	4	.....	.....	.....	.....	592	685	545	550	.....	.....	14,778	5,652	0.383	0.619
December 12	30	23	8	4	14	13	8	6	.....	.....	.....	.....	507	518	455	588	.....	.....	15,207	8,022	0.528	0.880
January 13	30	30	8	9	14	15	8	6	.....	.....	.....	.....	642	545	719	603	.....	.....	19,237	11,574	0.602	1.000
February 13	31	34	8	9	14	17	9	8	.....	.....	.....	.....	503	371	619	437	.....	.....	15,559	11,274	0.726	1.182
March 13	31	36	8	10	14	18	9	8	.....	.....	.....	.....	678	565	785	645	.....	.....	21,322	13,552	0.637	1.039
April 13	32	42	8	12	14	19	10	11	.....	.....	.....	.....	698	650	767	637	.....	.....	22,310	22,654	1.015	1.659
May 13	32	47	8	14	14	19	10	12	.....	2	.....	.....	796	801	816	762	.....	.....	25,441	21,662	0.853	1.390
June 13	32	47	8	14	14	19	10	12	.....	2	.....	.....	778	819	786	722	.....	.....	24,873	23,026	0.925	1.448
July 13	38	55	8	14	18	24	11	15	1	2	.....	.....	738	886	673	750	571	.....	28,024	26,040	0.930	1.413
August 13	41	60	8	14	18	27	14	17	1	2	.....	.....	784	885	802	718	500	.....	32,074	44,328	1.380	2.023
September 13	43	63	8	14	19	27	15	20	1	2	.....	.....	783	865	806	721	569	.....	33,620	31,178	0.928	1.350
October 13	45	66	8	14	20	30	15	20	2	2	.....	.....	781	867	889	655	298	.....	35,137	32,874	0.938	1.335
November 13	46	66	8	14	20	30	16	20	2	2	.....	.....	694	759	836	526	313	.....	31,839	32,346	1.015	1.439
December 13	46	69	8	14	20	30	16	22	2	3	.....	.....	736	710	909	556	529	.....	33,819	34,700	1.025	1.451
January 14	46	69	8	14	20	30	16	22	2	3	.....	.....	713	775	865	513	523	.....	32,751	39,370	1.220	1.703
February 14	46	69	8	14	20	30	16	22	2	3	.....	.....	309	315	373	236	213	.....	14,179	21,602	1.524	2.154
March 14	46	69	8	14	20	30	16	22	2	3	.....	.....	604	629	722	462	435	.....	27,736	38,802	1.420	1.980
April 14	46	70	8	14	20	30	16	23	2	3	.....	.....	755	825	858	615	544	.....	34,687	35,162	1.014	1.434
May 14	46	73	8	14	20	31	16	25	2	3	.....	.....	810	832	861	751	661	.....	37,229	41,538	1.116	1.642
June 14	50	74	8	14	20	31	20	26	2	3	.....	.....	773	822	847	695	598	.....	38,614	43,978	1.137	1.539
July 14	54	81	9	17	21	31	22	30	2	3	.....	.....	759	771	780	758	456	.....	40,907	39,808	0.974	1.321
August 14	56	81	11	17	21	31	22	30	2	3	.....	.....	756	737	815	725	597	.....	42,359	40,780	0.965	1.328
September 14	56	81	11	17	21	31	22	30	2	3	.....	.....	780	751	848	743	599	.....	43,618	40,450	0.929	1.280
October 14	56	81	11	17	21	31	22	30	2	3	.....	.....	796	802	890	713	675	.....	44,541	44,616	1.002	1.373
November 14	58	86	11	17	22	34	22	30	3	5	.....	.....	674	550	801	628	493	.....	38,909	41,488	1.066	1.435
December 14	58	86	11	17	22	34	22	30	3	5	.....	.....	704	611	842	615	669	.....	40,785	57,856	1.419	1.910
January 15	58	86	11	17	22	34	22	30	3	5	.....	.....	690	608	835	589	674	.....	40,039	56,816	1.420	1.913
February 15	59	86	11	17	22	34	23	30	3	5	.....	.....	545	574	654	476	532	.....	32,160	49,942	1.554	2.080
March 15	60	86	11	17	22	34	24	30	3	5	.....	.....	736	658	880	646	673	.....	44,111	52,360	1.187	1.580
April 15	60	86	11	17	22	34	24	30	3	5	.....	.....	754	645	863	711	672	.....	45,161	49,806	1.103	1.469
May 15	62	89	11	17	22	34	26	33	3	5	.....	.....	731	620	838	690	697	.....	45,355	48,774	1.077	1.417
June 15	64	89	11	17	22	34	28	33	3	5	.....	.....	745	652	818	723	733	.....	47,615	50,414	1.059	1.381
July 15	64	89	11	17	22	34	28	33	3	5	.....	.....	740	618	757	780	684	.....	47,356	50,312	1.063	1.385
August 15	64	92	11	17	22	34	28	36	3	5	.....	.....	757	632	778	795	711	.....	48,462	50,180	1.036	1.350
September 15	65	92	11	17	22	34	28	36	4	5	.....	.....	792	686	850	799	715	.....	51,477	56,446	1.096	1.430
October 15	65	92	11	17	22	34	28	36	4	5	.....	.....	784	685	890	747	735	.....	50,965	56,592	1.100	1.444
November 15	66	94	11	17	22	34	29	36	4	7	.....	.....	731	628	835	715	657	.....	48,282	55,464	1.150	1.446
December 15	66	94	11	17	22	34	29	36	4	7	.....	.....	523	445	577	519	531	.....	34,515	50,398	1.540	1.425
January 16	67	98	11	17	22	34	30	40	4	7	.....	.....	595	530	608	555	496	.....	39,820	52,448	1.317	1.660
February 16	70	100	11	17	22	34	31	40	6	9	.....	.....	401	327	450	403	346	.....	28,055	54,708	1.953	2.350
March 16	74	100	11	17	22	34	34	40	7	9	.....	.....	506	405	637	462	471	.....	37,475	65,220	1.740	2.034
April 16	74	102	11	17	22	34	34	40	7	11	.....	.....	615	524	704	610	501	.....	45,523	59,238	1.302	1.487
May 16	75	105	11	17	22	34	34	42	8	12	.....	.....	693	625	749	715	527	.....	51,854	62,852	1.211	1.394
June 16	77	105	11	17	22	34	36	42	8	12	.....	.....	678	602	734	697	541	.....	52,155	62,684	1.200	1.380
July 16	77	105	11	17	22	34	36	42	8	12	.....	.....	685	556	714	726	594	.....	52,705	49,510	0.940	1.077
August 16	78	105	11	17	22	34	36	42	9	12	.....	.....	720	716	697	706	637	.....	56,052	55,836	0.996	1.125
September 16	78	106	11	17	22	34	36	42	9	13	.....	.....	695	634	715	696	724	.....	54,255	55,526	1.025	1.154
October 16	82	112	11	17	22	34	36	42	9	13	4	6	688	592	735	735	669	316	56,402	63,294	1.123	1.107
November 16	84	112	11	17	22	34	36	42	11	13	4	6	625	578	685	649	495	581	52,498	68,752	1.310	1.261
December 16	84	119	11	17	22	34	36	45	11	16	4	7	573	535	630	592	459	493	48,044	83,258	1.735	1.673
January 17	86	119	11	17	22	34	38	45	11	16	4	7	560	529	625	566	460	491	48,135	74,490	1.549	1.499

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

IMPEDANCE OF STEEL RAILS

A Summary of Recent Research Work in Electrical Engineering at the Massachusetts Institute of Technology

IN THE design and operation of alternating-current traction systems in which rails are used as electrical conductors, accurate knowledge of rail impedance is of no little importance. In order to add to this knowledge, the research division of the electrical engineering department of the Massachusetts Institute of Technology has conducted a research to determine, by direct measurement, the impedance offered to alternating currents by standard steel rails of various shapes and sizes, and also to ascertain how this impedance varies with frequency and with current strength. Furthermore, it was desired to find, if possible, a simple theory by means of which the rail impedance can be calculated from physical data concerning the steel used in the rails and from the dimensions of the rails.

The rails employed in the tests were furnished through the courtesy of two steel rail manufacturing companies. The samples tested were of standard length, 33 ft. (10.07 m.), and ranged in weight from 60 lb. to 100 lb. per yd. (30 kg. to 50 kg. per m.). Of the thirteen rails tested, eleven were track rails, while two were contact rails. Frequencies of 25 and 60 cycles per second were used in testing each rail sample. A few tests were also made at 45 cycles per second. The rail current strengths employed varied from 10 amp. to 800 amp. r.m.s.

In order to obtain the results desired, it was necessary to measure, in addition to the direct-current resistance, the alternating-current voltage drop and current in the rail and the phase angle between them. Four test methods were tried: (1) by astatic electro-dynamometer, (2) by oscillograph, (3) by alternating-current potentiometer, and (4) by a special form of laminated iron-core electro-dynamometer. Method (4) was found most satisfactory for these particular tests, method (3) also being employed in a few tests to check the results obtained by method (4). The direct-current resistance of the rails was measured, in the usual way, by direct-current potentiometer. During the tests special efforts were made (1) to duplicate practical railway conditions as nearly as possible in regard to positions of rail and return conductor, (2) to have an approximately sinusoidal current in the rail, (3) to eliminate errors of measurement arising from the change of rail temperature with change of current, and (4) to correct for the voltage induced in the potential leads by reason of the mutual inductance between potential circuit and rail circuit.

Some of the results obtained and conclusions reached are as follows:

The ratio of alternating-current resistance to direct-current resistance, called "resistance ratio," was found in practically all cases tested to reach a maximum value within the limits of rail current from 10 amp. to 800 amp. r.m.s. This maximum value of resistance ratio, at 25 cycles per second, was observed to vary between 5.3 and 10.1 for ten track rails and between 10.9 and 13.4 for two contact rails. For most rails the lowest observed value of resistance ratio of a sample was from 40 to 60 per cent lower than the maximum value for that sample at constant frequency, the reason for this large

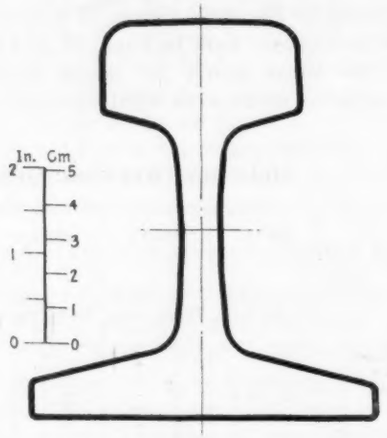


FIG. 1—EQUIVALENT SKIN DEPTH OF ALTERNATING-CURRENT PENETRATION OF STEEL RAIL

range of resistance ratio being the variation in the permeability of the steel at the various flux densities corresponding to different strengths of rail current.

The equivalent skin depth of alternating-current penetration—defined as the thickness of uniform rail skin which would offer the same resistance to a direct current as the entire section offers to an alternating current—was found, by calculation from the experimental results, to be 1.5 mm. (1.16 in.) for a typical rail, at 25.5 cycles per second and at maximum permeability. (See Fig. 1.)

The maximum observed skin-effect resistance ratio was found to vary substantially as the square root of the impressed frequency between the limits of 25 and 60 cycles per second.

The self-inductance of the rails was also found to increase, with increasing current, to reach and pass a maximum value, for current strengths up to 800 amp., the total change of inductance varying, for the different rail samples, from 15 to 30 per cent, approximately.

The rail inductance is greater at 25 cycles per second than at 60 cycles per second, but the rail reactance at 60 cycles per second is greater than that at 25 cycles per second.

From the experiments conducted, it would seem that the skin-effect resistance ratio of a rail to a given alternating-current frequency and current strength can be approximately calculated by a simple formula involving measured values of direct-current conductivity and permeability of the steel, the area of cross-section of the rail, the rail perimeter, and an experimentally deter-

mined factor to cover certain discrepancies. This factor appeared to be not more than 1.3 at the maximum skin-effect ratio.

The complete report on the investigation, entitled "Experimental Researches on the Skin Effect in Steel Rails," by A. E. Kennelly, F. H. Achard and A. S. Dana, is available as Research Bulletin No. 12 of the Electrical Engineering Department, Research Division of the Massachusetts Institute of Technology.

Generators, Motors and Transformers

Pressure Harmonics in Polyphase Systems and Windings.—B. HAGUE.—The continuation of this highly mathematical article. In the present installment the author discusses interlinking polyphase systems, dealing both with star-connected and mesh-connected systems. He then discusses the harmonics in symmetrical polyphase systems and the effect of interlinking on the harmonics.—London *Electrician*, March 23, 1917.

Efficiency of Electric Generators.—W. KUMMER.—In giving guarantees of electric generators the Swiss manufacturers generally adopt the method laid down by the Association of German Engineers for the determination of the "conventional efficiency" from a no-load test. This method has the defect of failing in the two important cases: (1) when the generators are to act as loading machines for the determination of the efficiency of prime movers, and (2) when the manufacturer of prime movers is in the position of having to guarantee the consumption of a prime mover per kilowatt-hour of electrical energy generated. The "conventional efficiency" may differ from the actual efficiency by as much as 8 per cent through changes of the losses in the machine with variation of load. These changes are particularly to be found in the iron losses. The article describes how these losses may be determined for three-phase alternators. If the resistance drop per phase is $E_r = Ir$ and the reactive drop per phase is $E_s = Ix$, it

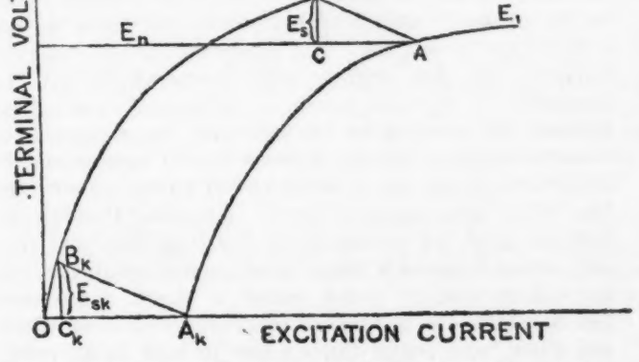


FIG. 2—CURVES SHOWING NO-LOAD AND LOAD TEST AT NORMAL CURRENT

is necessary to note that r and x are not really constants, but vary with the load. If a no-load, short-circuit test at normal current and a load test at normal current and cos $\phi = 0$ are taken, the curves in Fig. 2 may be drawn. The no-load curve E_o may be obtained by driving the machine as a generator or by running it as a synchronous motor at various voltages and excitation for minimum armature current. The short-circuit test gives the point A_k, and the point B_k may, in the case of Y-connected machines, be measured between the neutral point and one phase. The load curve E_l is obtainable by driving the machine at cos $\phi = 0$ as an over-excited synchronous motor. $E_{sk} = B_kC_k$ is the value of E_s at short-circuit, and A_kC_k represents the armature back-ampere-turns at normal current. At normal voltage E_r we have $AC = A_kC_k$ and $BC = E_s$, which differs for each voltage. To determine E_r and r the machine must be driven at short-circuit by a calibrated motor to determine the mechanical output; this is equal to E_rI per phase. For the load points the machine is run as a synchronous motor at cost $\phi = 0$, the input being measured by wattmeter and being taken as equal to E_rI per phase. The values obtained for under-excitation and over-excitation will not agree exactly with each other or with the short-circuit value, but the differences will not be great, and variations will also be found at different currents owing to the skin effect. It will generally suffice to take r as a constant as determined from the short-circuit test at normal current. Having determined E_s and E_r for different voltages, the corresponding internal voltage E_a may be deduced. For each value of E_a the iron losses may be determined by driving the unloaded machine by a calibrated motor and taking E_a = open-circuit voltage. In this manner a series of curves is obtained for the iron losses at various voltages and various currents. In some cases B_kC_k is not able to be directly determined, and then it is necessary to calculate A_kC_k as the armature back-ampere-turns. If the necessary data for this calculation are not available, but if the point A is known, AC may be obtained by the method given by Fischer-Hinnen.—From *Schweiz. Elektrot. Verein Bulletin*, Vol. VII, p. 273, October, 1916; abstracted in *Science Abstracts*, Section B, Feb. 26, 1917.

Traction

Booster Transformers in Single-Phase Lines.—CH. DACHARY.—The French railway company "du Midi" has carried out for several years an investigation of the influence of single-phase traction current on telegraph and telephone lines in the neighborhood. The author, who has been specially connected with this investigation, describes the use of booster transformers or sucking transformers ("transformateurs suceurs") on the line from Perpignan to Villefranche. The principle of the action of these booster transformers in forcing the return current into the rail or into the special return conductor is discussed with the aid of diagrams.—*Rev. Gen. d'Elec.*, March 3, 1917.

Electric Automobiles.—An account of part of the discussion which followed L. Broekman's recent paper on self-propelled electric vehicles and their applications in Great Britain, which was abstracted at some length recently in the Digest. T. B. Murray referred to experiments made twenty years ago in which the useful life of the batteries then available was less than three months, so that the electric automobile then proved a failure. The speaker said that "while the electrical vehicle would no doubt have a certain amount of scope in fairly level cities with decently paved streets, and for some purposes had undoubtedly outstanding merits, he was afraid that its sphere of action, in the meantime at least, was necessarily limited, even if one recognized the fact that it was bound to have influential sponsors and backers in the various electric light and power companies which had energy to sell." He claimed that electric automobiles have difficulty in climbing hills, and

he thought that until there was a prodigious improvement in the energy-weight equivalent of storage batteries the scope of the electrically driven motor car was bound to be limited.—*Transactions*, Institute of Engineers and Shipbuilders in Scotland, Vol. IX, Part 4, February, 1917.

Wires, Wiring and Conduits

Effect of Heat on Cotton and Paper.—L. SCHUELER.—A report of the "Testing Bureau of the German Government" on a new series of tests on the effect of temperature upon the mechanical strength of paper and yarn. If yarn is heated in oil to which air has access it gradually becomes disintegrated, probably owing to the formation of acids, which tend gradually to become asphalts. The yarn was therefore heated in oil contained in glass-stoppered vessels. Curves are given showing the way in which the mechanical strength falls off in the case of (1) cotton heated in air, (2) cotton heated in oil, and (3) cable paper heated in oil. At the end of a lengthened period, say of 100 days, the mechanical strength tends to reach a steady value. Curves are also given showing the value of this steady mechanical strength (expressed as a percentage of its initial value) as a variable dependent on the temperature. The main demand is made on the mechanical strength of the insulation during the act of winding; if the winding is successfully carried out, a lower mechanical strength will thereafter suffice. If this lower mechanical strength is taken as 40 per cent of its initial value, then the curves show that cotton heated in air can be subjected to a steady temperature of 102 deg. C., cotton heated in oil to 114 deg. C., and paper heated in oil to 125 deg. These temperatures are higher than those usually prescribed.—From *Elek. Zeit.*, Oct. 5, 1916, abstracted in *Science Abstracts*, Feb. 26, 1917.

Installations, Systems and Appliances

Small British Power Station.—E. M. LACEY.—An illustrated abstract of a paper read before the (British) Institution of Civil Engineers describing the new electric power station at Birchills, Walsall. It contains three generating sets, each of 4000 kw. The capital cost of the station comes out as low as $33 per kilowatt installed. This is thought to make out a strong case for the small station. "One of the objects of this paper is to show that a power station of 2000-kw. to 16,000-kw. rating can be so designed as to produce electricity at such a low cost that economy in production due to further increase of capacity is not as considerable as has frequently been assumed. While it may be admitted that the costs of production will decrease to a limited extent as the plant capacity of a station increases from, say, 12,000 kw. to 50,000 kw., yet in many cases which necessitate the transmission of electricity over more extensive areas in order to secure a larger demand such decrease in the costs of production would not be sufficient to balance the additional costs of the longer transmission system." In a long editorial on the subject this argument is contradicted, although it is admitted that the capital cost of $33 per kilowatt installed is very low. This compares with $55 per kilowatt for the large new power station of Manchester and the figures of $35 to $37.50 per kilowatt estimated by Klingenberg for very large power stations. The reasons of the low power cost at the Walsall station are discussed. "One item which undoubtedly leads to such a saving is the use of the combined boiler unit, consisting of a Babcock & Wilcox boiler with superheater, and its own economizer mounted on top, each such unit having its own small chimney shaft with induced draft. This arrangement not only leads to a saving in this part of the equipment, but it also means a considerable narrowing down of the width of the boiler house, with corresponding less cost. There is also a shortening of steam pipes. Further, there is no duplicate coal conveyor, which seems a doubtful economy where the bunker capacity is small, and one not leading to any great saving. The only other item making for cheapness in the present instance is the Reyrolle switchgear, which avoids the necessity of special buildings and the extensive work that becomes a necessity in the case of cellular construction. Lastly, there seems to have been no large expenditure on the site." The author's "heresy" in favor of the small station is deprecated at a time in which there is such a tendency toward centralization of electricity supply. It is pointed out especially that the possible great improvement of the load factor due to enlarging a station is overlooked. Further, if anything is to be done in the carbonization of coal before it is used for power purposes, this will only become practicable with large power plants.—London *Electrician*, March 30, 1917.

Electrophysics and Magnetism

Magnetic Properties of Iron, Nickel and Cobalt Above the Curie Point, and Keesom's Theory of Magnetization.—EARLE M. TERRY.—An abstract of a paper read before the American Physical Society giving the final results of an investigation of the magnetic properties of iron, nickel and cobalt from the temperature at which ferro-magnetism disappears up through the melting point. The work has been carried out in a good vacuum, the high temperatures being obtained by means of a special tungsten furnace. The results show that Curie's law, $xT = \text{const}$, where x is the susceptibility and T the absolute temperature, holds in the case of nickel only, and here in but a restricted region. For beta iron, beta cobalt and beta nickel in the lower temperature region, the $1/xT$ curves all show a distinct concavity upward instead of being straight lines, as demanded by Curie's law. For gamma iron, the susceptibility varies only slightly with temperature, but the concavity of the xT curve is downward instead of upward, as required by the law. At the gamma-delta transformation point an increase in x of approximately 50 per cent occurs above which the xT curve is a straight line with a large negative slope. In passing through the melting point the susceptibility for iron decreases rapidly, while for nickel there is no change whatever, but for cobalt the xT curve shows a slight depression. These results are in marked contrast to those of Weiss and Foëx, who found Curie's law to hold in all cases. Keesom's quantum theory of magnetization, including the assumption of a zero-point energy, gives xT curves of the same general character as those obtained by the author, but they depart from the asymptote less rapidly than required by experiment. An attempt has been made to obtain a better fit by modifying the theory by the assumption of a larger zero-point energy, but it has been found that even when the latter is taken twenty times that of the theory the agreement with experiment is still unsatisfactory.—*Phys. Review*, March, 1917.

Readers' Views and Comments

Part-Slot Fractional-Pitch Windings

To the Editor of ELECTRICAL WORLD:

Sir: I read with much interest the article under this heading by Theodore Schou which appeared in your issues of March 17 and April 21, and should like to contribute a little information which may be of assistance to those interested in this subject.

On page 500 Mr. Schou states: "As mentioned before, 'chording,' or applying a fractional pitch winding, may tend to improve the wave form, and a winding having a throw of about 83 per cent of the pitch or a chord factor of 0.966 seems to have the tendency, in case of star connection, to reduce the larger higher harmonic to a minimum."

As a matter of fact, the use of any reasonable fractional pitch winding not only may but *does* improve the wave form in every case although the particular harmonics effected depend upon the degree of pitch reduction. The amount by which any particular pitch reduction reduces any particular harmonic may be very simply computed. This has been done and the results published first in a paper by the writer, entitled "Split Pole Synchronous Converters," in the *Transactions* of the A. I. E. E., June, 1908, and later in a paper entitled, "Electromotive Force Wave Shape in Alternators." A. I. E. E., July, 1909, and also in the fourth edition of the Standard Handbook for Electrical Engineers, Section 7, page 453. The method is explained in both of the above-mentioned papers.

A glance at the curves referred to in the Standard Handbook will show that the 83 per cent pitch mentioned in Mr. Schou's article reduces the fifth and seventh harmonics to about 26 per cent of the value which they would have in the full-pitch winding, but that it does not affect the eleventh and thirteenth harmonics. From these same pitch-differential-factor curves and Mr. Schou's harmonic analysis of the field form given in Fig. 11 of his article, the amount by which any of the harmonics are reduced by any one of the pitch reductions given may be readily obtained; also whether or not the harmonics are reversed is clearly shown. In other words, it is quite unnecessary to go through the very tedious process indicated in Mr. Schou's paper to determine the effect of any particular pitch reduction upon the emf. wave.

A very important advantage of "chording" in high-speed machines, (not mentioned by Mr. Schou) is the reduction in over-all length of the machine. This is particularly the case in two-pole machines, where a full pitch winding is practically out of the question.

Coming now to the question of the fractional number of slots per pole per phase, it is a very simple matter to state the effect of this change upon the wave shape, in terms of an equivalent integral number of slots per pole per phase. For example: one and a quarter slots per pole per phase, with a normal balanced winding, is, as far as wave shape is concerned, exactly equivalent to five slots per pole per phase; or, in general, if the fractional number be expressed in the form, $a + (b \div c)$ where b and c have no common divisor greater than unity, the equivalent number of slots per belt is $ac + b$. With this understanding, the belt differential factor, or, as Mr. Schou calls it, the spread factor, may be readily computed for both the fundamental and the harmonics. This is given in the tables of the two above-mentioned articles as well as in the Standard Handbook for Electrical Engineers. These latter tables show the exact percentage to which the various harmonics are reduced in the emf. wave by the belt differential action.

By multiplying together the belt differential factor and the pitch differential factor for any particular harmonic the total differential factor for this harmonic is obtained. It is thus quite unnecessary even to plot the resulting emf. curve, since it is completely described in its most useful form when the harmonics are stated in terms of the fundamental.

It should be noted in connection with part-slot windings for polyphase machines that that scheme of connections which gives an exact balance in magnitude, wave shape and phase difference is not always so obvious as it might seem, and considerable care must be employed in laying it out.

About two years ago A. A. Prior—at that time one of the writer's assistants—designed a double inductor alternator with ninety slots in each stator, with seventeen pairs of poles on one side and nineteen pairs of poles on the other side of the rotor, giving at 3600 r.p.m. frequencies corresponding to the seventeenth and nineteenth harmonics of a sixty-cycle system. It will be observed that this machine has less than one slot per pole per phase in both stators. It has a capacity of about 30 kva. and has now been in use for some time in connection with a research on core-loss analysis. Its wave shape at no load is practically sinusoidal as far as can be detected by ordinary means.

It will be noted that in each stator the winding is equivalent to fifteen slots per pole per phase. The coil pitch or throw in each stator is two slots, which corresponds to a pitch of 0.755 in one and 0.843 in the other. By applying the belt differential factor corresponding to a three-phase machine with fifteen slots per pole per phase, and the pitch differential factors corresponding to the above given pitches, the percentages by which the various harmonics are reduced from their values in the field form are readily obtained from the tables and curves above mentioned, and it will be found that the total reduction or differential factors for practically all of the harmonics are such that with any reasonable field form, the emf. wave form, with Y connection of the phases, will be practically sinusoidal, even under considerable distortion of the field form by armature reaction.

At the time the above alternator was designed a systematic scheme was developed by Mr. Prior for the laying out of the connections for the three phases in such a way as to insure balance in magnitude and wave shape and symmetry in phase displacement. This scheme will probably be published by Mr. Prior.

C. A. ADAMS.

Massachusetts Institute of Technology, Cambridge, Mass.

Clearing Up a Possible Misapprehension

To the Editor of ELECTRICAL WORLD:

SIR: In your issue of April 7, 1917, there appeared an article prepared by the writer under the title "Poor Lighting Promotes Public Ownership" that had for its object to point out the necessity for greater care on the part of central stations generally to see to it that their customers are educated up to the proper use of light, so that poor lighting shall not serve as an argument for replacing central station service with municipal service.

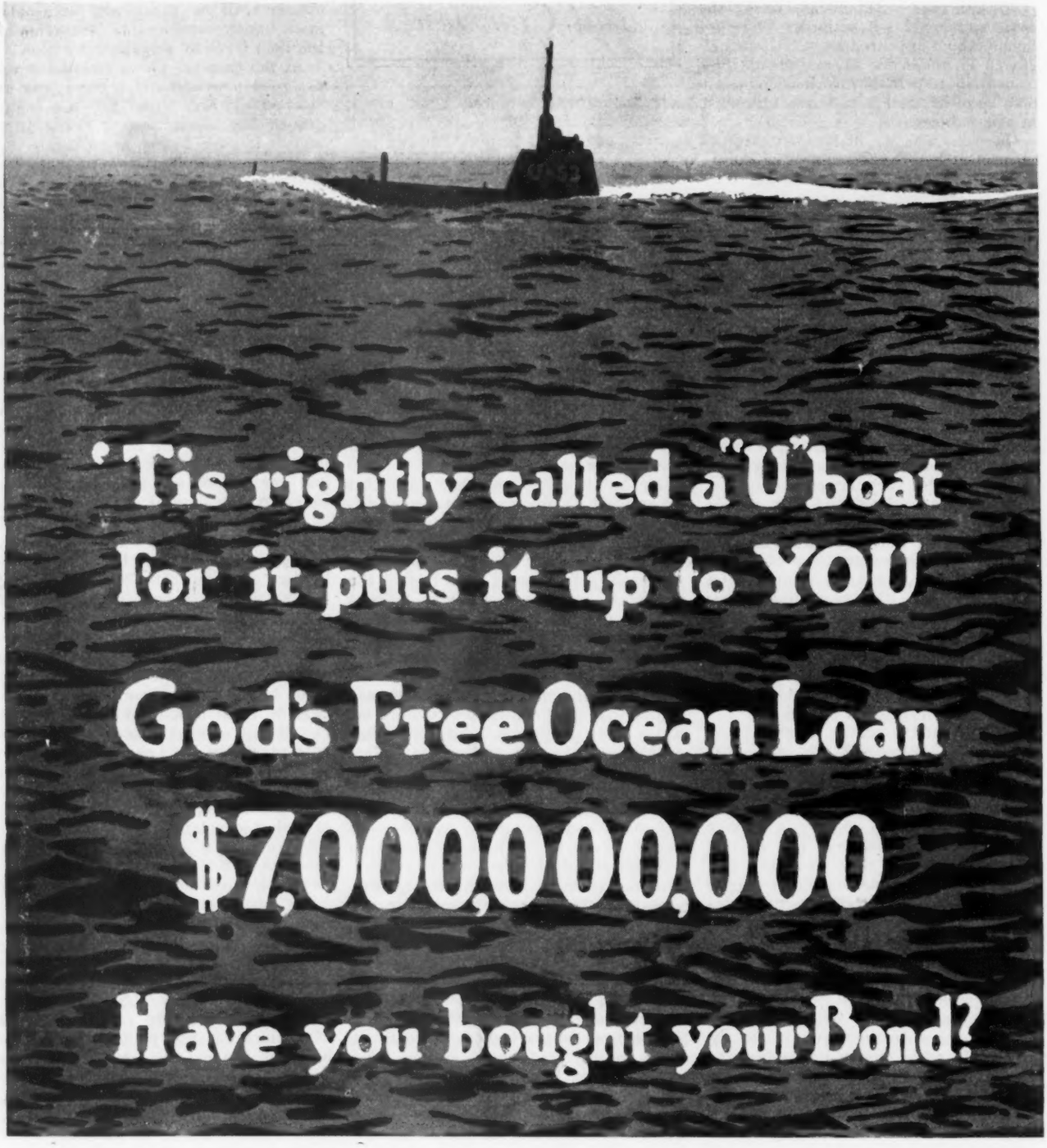
To illustrate this matter, the case of the borough of Catasauqua, Pa., was used, where application was recently made to the Pennsylvania State Public Service Commission for permission to install a municipal plant to compete with service of the Lehigh Valley Light & Power Company. Inasmuch as the article seems to have led some to think that the author accused this company of being constantly neglectful of its opportunities along this line, and also that some feeling of antagonism between him and the company in question must have prompted the use of this case to illustrate the point brought out, the writer takes this early opportunity to state forcibly that the use of the Catasauqua case and the reference to the Lehigh Valley Light & Power Company were solely for the purpose of illustrating the point forming the basis of the article, and furthermore that there was not the slightest cause on the part of the author for other than the most cordial and friendly attitude toward the company in question.

As a matter of record the company had experts in Catasauqua for more than a year for the specific purpose of improving conditions there, and the writer hoped that a reference to such a small portion of a large territory would not in any sense seem to detract from the good service being rendered to 98 per cent of the company's customers. He is sure that this statement will remove any misunderstanding as to his motives, and that any reader who may have noted the article will look upon it merely as illustrating the principle maintained.

C. E. CLEWELL.

Philadelphia, April 27, 1917.

Liberty's War Loan for the World



Mobilization of capital is one of the strongest weapons in the war against the German government.

The first issue of the "liberty loan of 1917" will be $2,000,000,000. Secretary of the Treasury McAdoo announces that subscriptions may be made now at par to the great loan. They will be received until June 15. The bonds will bear 3½ per cent interest and will be dated July 1, 1917, with interest payable Jan. 1 and July 1. In every sense the loan will be a popular one, for the bonds will be issued in denominations as low as $20. If any subsequent series shall be issued at a higher interest rate before termination of the war between the United States and the German government the bonds of this series will be convertible into bonds bearing such higher rate. Mr. McAdoo says:

"Since the great bulk of the credits to be established for the foreign governments is required for purchases made in this country, the operation will be largely a transfer, or exchange, of credits and should have a stimulating and helpful effect upon the general business and financial situation."

It is the largest single piece of financing the United States government has ever attempted.

To uphold the government, to provide abundant means for the mighty forces of the nation, the editors of the ELECTRICAL WORLD urge every one to do his mite.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

UTILITIES PLANNING TO GIVE MAXIMUM NATIONAL SERVICE

It Is Understood That Heads of Important Interests Are Studying Arrangements to Secure Most Efficient Results

The ELECTRICAL WORLD understands arrangements are being studied by the heads of important utility interests as to how to secure to the government the most efficient utilization of the resources of the utilities engaged in public service in men and facilities which they command and at the same time provide for the continued and uninterrupted operation of the plants which are so necessary to the maximum output that is an essential part of the industries contributory to the manufacture of the munitions and supplies of all kinds vital to the proper conduct of war.

Advantage will no doubt be taken of the experience had in Great Britain along similar lines so as to avoid duplication of effort and some of the mistakes which were made early in the war by the British government in its relation to the utilities and which in the early stages of the war seriously crippled the conduct of the utilities and the intensive co-operation which they were later able to afford in the general co-ordination of industrial activities.

ELECTRIC RATES RISE WITH COAL IN FALL RIVER, MASS.

Electric Company Advances Power Rates to Conform to Higher Cost of Fuel—Graduated Scale for Future

The Fall River (Mass.) Electric Light Company has made an increase in power rates based on the high cost of coal and graduated on the basis of 1 mill increase per kilowatt-hour for every dollar of coal cost to the company above $4 per ton.

In introducing the new schedule the company pointed out that its policy consistently has been to base power rates upon a small margin of profit and that rates have been reduced from time to time as conditions have warranted.

Since Jan. 1, 1916, the cost of coal to the company has increased nearly 100 per cent, and it has been obliged to contract on this basis for the coming year's supply. A notice to customers states that in the manufacturing cost of electricity coal is the principal item and last year represented 70 per cent of the cost of generation.

"Every dollar of increase in the cost of coal over $4 per ton," the company says, "represents an increased cost to the company of approximately 1 mill on every kilowatt-hour generated or sold. Our present power rates were figured and adopted when coal was $3.50 per ton, and we have assumed a coal cost of $4 per ton before increasing our present rate. Owing to the abnormal prevailing conditions, which include not only the high cost of coal but also material, apparatus and labor, we feel that it is necessary and justified to increase our present power rate on the basis of 1 mill per kilowatt-hour per dollar increase in the cost of coal above $4 per ton.

"We believe and sincerely hope that these extreme prices are temporary, and wish to assure you that we will restore our present rates immediately on the return of coal prices to their original normal figures. Based on the price of coal for the coming year the increased cost will be between 2.75 and 3 mills per kilowatt-hour. This increase will go into effect and be figured on all bills rendered on and after July 1 next."

NIKOLA TESLA IS AWARDED THE EDISON MEDAL BY A. I. E. E.

"Meritorious Achievements in His Early Original Work in Polyphase and High-Frequency Currents" to Be Honored on May 18

The seventh Edison medal, which was awarded to Nikola Tesla on Dec. 13, 1916, "for meritorious achievements in his early original work in polyphase and high-frequency electric currents," will be presented to Mr. Tesla at the annual meeting of the American Institute of Electrical Engineers in the auditorium of the Engineering Societies Building, 29 West Thirty-ninth Street, New York, on Friday evening, May 18, 1917, at 8.30 p. m. Ladies are invited to attend this meeting.

President H. W. Buck will preside, and addresses will be made by Dr. A. E. Kennelly, chairman of the Edison medal committee; Charles A. Terry, New York, and B. A. Behrend, Boston.

HISTORY OF THE EDISON MEDAL

The Edison medal was established upon the initiative of a group of friends and associates of Thomas A. Edison for the purpose of recounting and celebrating the achievements of a quarter of a century in the art of electric lighting, with which the name of Edison is imperishably identified. It was decided that the most effective means of accomplishing this object would be by the establishment of a gold medal which during the centuries to come should serve as an honorable incentive to scientists, engineers and artisans to maintain by their works a high standard of accomplishment.

The Edison medal was therefore established and endowed with a trust fund, under an indenture dated Feb. 11, 1904, whereby the A. I. E. E. agreed to award the medal annually. The medal is awarded each year by a committee consisting of twenty-four members of the Institute to a resident of the United States of America or its dependencies, or of Canada, "for meritorious achievement in electrical science or electrical engineering or the electrical arts."

NATIONAL PREPAREDNESS IN THE N. E. L. A. PROGRAM

Large Part of the Industry in Military and Industrial Mobilization the Conspicuous Feature for Next Week's Convention

A letter of President Herbert A. Wagner of the National Electric Light Association, sending the tentative program for next week's convention to members, says:

PRESIDENT WAGNER'S LETTER

"This program may be departed from in some particulars, but you will note that the first day at least is to be devoted to a general conference on national preparedness and the consideration of the part which our association and member companies can take in the general scheme of military and industrial mobilization.

"As yet we have been unable definitely to obtain acceptances from the prominent speakers whom we hope to have to address the meeting. The name of Howard E. Coffin is used without his authorization, merely in the strong hope that he can arrange to be with us.

"This tentative program is being sent you in order that you will get some idea of the general character of the proposed meeting so that you may be able to determine upon the personnel of your representation. The matters for general discussion are so important to public service corporations that they demand the presence of those who can fully represent the policies and aims of member companies and speak with authority for them.

"It should also be borne in mind that while it is not expected that the attendance will be nearly so large as heretofore at usual annual conventions, the representation should be sufficiently general and complete to assure the general support of the association in the election of officers and executive committee men both in the national organization and in our four national special sections, and for the consideration of other executive matters necessary at annual executive meetings."

The annual meeting of Class "D" members of the N. E. L. A. will be held at the association offices at 12 o'clock noon on Thursday, May 10. It is earnestly requested that all members in attendance at the convention attend this meeting as matters of importance will be brought up for attention.

As is indicated by the program published herewith, the arrangements for the convention are extremely flexible, and provide for either curtailment or expansion as necessities or desires develop at the time. It is made obligatory by the constitution to hold a formal meeting for the election of officers, and the opportunity for executive conference on war matters is invaluable.

TENTATIVE PROGRAM OF N.E.L.A. SPECIAL MEETING

in lieu of usual form of annual convention, Wednesday and Thursday, May 9 and 10, 1917, Engineering Societies Building, 29 West Thirty-ninth Street, New York City.

WEDNESDAY, MAY 9, 10 A.M.

President's address.
Appointment of committee on president's address.
Secretary's report.
Report of public policy committee.
Address by Howard E. Coffin.
Addresses by four to six prominent association members.
Adjournment at 1 p.m.

WEDNESDAY, MAY 9, 2.30 P.M.

General discussion on morning's addresses and formulation of definite recommendations to member companies for the conduct of their affairs in relation to the government's plans for raising military forces and mobilizing the nation's industries.

THURSDAY, MAY 10, 10 A.M.

Treasurer's report.
Appointment or election of special committees.
Election of nominating committee.
Committee on constitution and bylaws.
Committee on Doherty and Billings prizes.
Committee on memorials.
Committee on resolutions.
Committee on nominations for national sections.
Reports of all national general committees received by title only.

THURSDAY, MAY 10, NOON

Class D members.

THURSDAY, MAY 10, 2:30 P.M.

General and executive session.
Report of committee on constitution and bylaws.
Report of national nominating committee.
Elections.
Report of membership committee.
Report of committee on safety rules.
Report of exhibition committee, etc.
Any other reports.
Adjournment.

THURSDAY, MAY 10, 2:30 P.M.

Parallel executive and general meetings of all national sections for nominations, elections and reading of reports by title only.

FRIDAY, MAY 11, 10 A.M.

Parallel national section meetings for unfinished business if desired by section chairmen.

THURSDAY AFTERNOON AND FRIDAY

Section meetings may be conducted as desired by their respective chairmen. Papers may be read by title if desired and time permits.

As to possible exercises on Friday, if the national section members are present in sufficient numbers and enough interest is shown, it is regarded as quite likely that the various sections may discuss such important reports and papers as may be called for.

Edison Association

The convention of the Association of Edison Illuminating Companies, scheduled for September, has been postponed. Peter Junkersfeld, the president, has issued the following notice to members:

"In view of the existing state of war and after consultation with a majority of the executive committee, it has been decided to postpone the next convention of the Association of Edison Illuminating Companies, scheduled to be held next September at Spring Lake, N. J.

"It will probably be desirable to hold a short meeting the second week in September for the purpose of transacting necessary business as prescribed by the by-laws of the association. The time and place of such meeting will be announced later."

Westinghouse Agent-Jobbers

On account of the war situation and the fact that the National Electric Light Association and other associations, as well as various clubs, have abandoned conventions and meetings which have been scheduled for the next two or three months, it has been decided to postpone the May meeting of the Westinghouse Agent-Jobbers' Association to the annual meeting in November, 1917. The executive committee will meet May 18 to 21, and it is expected that several of the agent-jobbers will attend this meeting and will also go to the next meeting of the Electrical Supply Jobbers' Association, May 22 to 24 inclusive, at Hot Springs, Va.

Magazine Section PUBLIC LEDGER—PHILADELPHIA, SUNDAY MORNING, APRIL 29, 1917 5

"LIGHT UP PHILADELPHIA!" Slogan of Chamber of Commerce Campaign

City's Industrial Leaders Will Exploit "World's Greatest Workshop" by Unique Illumination Plan

Light conquers the "dark forces" of night in Philadelphia when the City Hall statue of William Penn is thus illumined

By Charles W. Duke

"TURN on the light!"

America has always been at it. As a robust infant the young, free country turned the light of freedom upon the despotic sway of kings. Filled with power at the union, the young colonists spoke in their might and their answer was recorded at Lexington, Valley Forge and Yorktown.

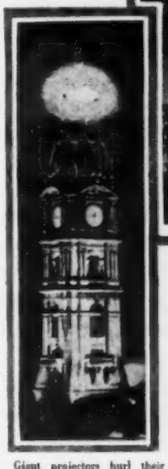
Shortly after American independence it became necessary for the youthful America to switch the searchlight of democracy again on the same kings. They were revealed playing the role of highwaymen with American ships and sailors on the free seas. The people spoke at Lakes Erie and Champlain, and the kings ceased their practices.

Later it became necessary for America to turn the light on herself. That light disclosed thousands of human souls burdened under the yoke of slavery. So brightly burned the light that the bands of slavery were dissolved and the shackles fell away from the limbs of the black man.

Again in recent years, the light was flashed on a little neighboring island and revealed it helplessly squirming under the cruel lash of a tyrant. Again the people spoke, the aggressor was taken to task and his victim not only freed but granted perpetual immunity from persecution.

Now, again, the light of democracy has been turned on centuries-old Europe, where the kings and emperors of a long line of kings and emperors are locked in the embrace of a titanic warfare. It has illumined the whole field of action and revealed again the people battling against the kings in the age-old struggle of democracy vs. autocracy. America follows along the pathway of light to answer with the sword the challenge to democracy.

It has ever been thus with America. "Turning on the light" has been a part of America from the beginning of the young republic. Light and civilization have been synonymous. The longer the light has burned the greater the progress. Truth has been the beckoning beacon. Under the limelight the rascals have turned and run to cover. Illumination has shrunk away before the light of research. Ignorance has been routed by the pitiless shafts of education. Democracy triumphs because of the light of humanity.



Giant projectors hurl their beams against the tower so that it is visible by night in four counties of Pennsylvania and in New Jersey

If this has been figuratively true of the progress of America, it has been also literally so. The world knew not electricity until Benjamin Franklin snatched it out of the sky one day on a kite string raised from the American soil. Since then democracy has attained its highest development under the influence of marvelous scientific achievements affecting mind and matter for the glorification of the human race in general.

Light today reveals the freedom and the purpose of America. In the harbor of New York, silhouetted against the inky darkness of night by the twinkle of twenty million candles, stands Liberty enlightening the world. The national Capitol at Washington is exalted in an aurora of electrical beauty that proclaims to all civilization the Truth and the Humanity of America. The statue of William Penn in the city where the young republic was born is illumined by long lines of light that bespeak the fearless principles of government laid down by Penn many years ago. So on throughout America.

The tendency is to flood-light America more than ever. Zeppelins or no Zeppelins, America turns on the light today in greater measure than ever. There are no Zeppelins that can turn out the light of America. The country's answer to the wilful-ness of nightfulness has been to turn on the lights a little higher. When some one suggested turning down the lights for fear the Zeppelins would get us, America's answer was to turn to a report published recently in the Electrician, from London, which related how in the period from August 1, 1914, to January 31, of last year, the number of fatal street accidents in London due to the lack of light was 954, as against 157 persons killed by Zeppelins during the same period. If any Zeppelins are coming to the United States there will be plenty of light to spot them and.

It has been considered most expedient to turn the light full and free on America at this juncture, in order to thwart any who might be conniving in dark corners to overthrow liberty. The foes within have been considered equally as dangerous as, if not more so than, the foes without. So the light has been streaming forth, figuratively and literally since America was ushered into the world war, and with efficacious results. Public safety today is promoted by shafts of light from giant projectors that flood railroad properties, docks and wharves, shipbuilding plants, navy yards, munition plants, arsenals and storehouses.

Ten cents is saving $10,000,000. Ten cents' worth of electricity burned nightly on a huge industrial plant bathes it in a glow that forbids the approach of a bomb-thrower or a firebrand. It is a dime's worth of energy turned into $1,000,000 worth of protection, and it is a new kind of public safety that in these turbulent times is proving its worth in kilowatts.

Starting with the marvels accomplished with flood lighting by the illumination of the Panama-Pacific International Exposition, this country has turned to electric lighting on a comprehensive scale. The industrial world first took it up as a wonderful advertising medium. Art approves it as a means of setting off to full value the architectural beauties of the nation. The church utilizes it on an elaborate scale. The pleasure-loving empire it for night strolling, tennis, motor racing and other outdoor activities. England is lifting the veil now at night. America is campaigning for recruits and warding off plotters by electricity. The searchlights of American warships are seeking out U-boats that American guns may drive them from the seas.

Everywhere one goes in the United States he finds wonderful illuminations. You have seen the State House in Boston, the Steeplechase Pier in Atlantic City, the Soldiers and Sailors' Monument on Riverside drive, New York; the exhibition field at Hempstead, Long Island; the new speedway at Sheepshead Bay, the new municipal pier in Chicago and many other notable examples of modern electric illumination everywhere you travel. Charles A. Steinmetz, the electrical wizard, in his new book on "America and the New Epoch," declares the marvels of modern electrical development are beyond all description and offered rich field for the exploitation of romance by a Jack London or a Rudyard Kipling.

Down in Colombia, South America, they gather wood at night by electric light. In Montana electric projectors are used for spotting logs and other material that come down the river and interfere with the dams. Coal is mined at night by the aid of electric illumination, steam shovels and dredges work at night, construction goes on in the New York and Philadelphia subways; the vast industrial resources of the country work twenty-four hours a day building up the nation's defenses. On every hand you see science turning night into day.

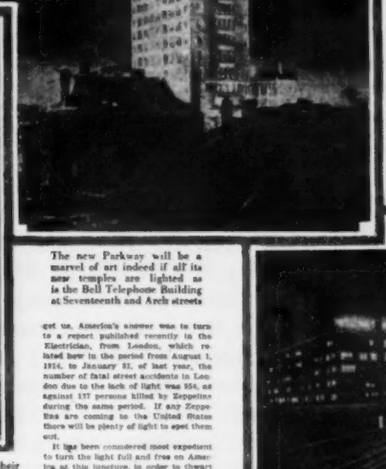
Such is the background that has given birth to a campaign about to be launched in Philadelphia to visualize before all the world the fact that Philadelphia is the world's greatest shop. New York has its Gay White Way, a grand canyon of lurid lights that proclaims the nation's central pleasure palaces. The campaign now to be initiated in that city under the auspices of the Philadelphia Chamber of Commerce proposes to make the railroad arteries leading in and out of Philadelphia great avenues of light that will proclaim to all the traveling public the fact that Philadelphia is the world's greatest workshop. This city stands at a strategic point in transcontinental travel. It is the gateway to the South from the North and the gateway to the North from the South. Much of the travel from the Atlantic to the Pacific coast runs through Philadelphia. It has been said that one-fifth of the traveling public in the United States annually pass through Philadelphia.

The Chamber of Commerce proposes to enlist every manufacturer and captain of industry in the Philadelphia district in a mega publicity campaign of this character. As you ride into the city today from New York or Pittsburgh or Washington you see sporadic outbursts of this kind of illuminative advertising. Scores of mills, factories, workshops, store houses and industrial plants have erected signs over their buildings. The idea is to have every single commercial concern enlisted in the campaign so that the avenues of travel to and from the city will be one continuous line of light.

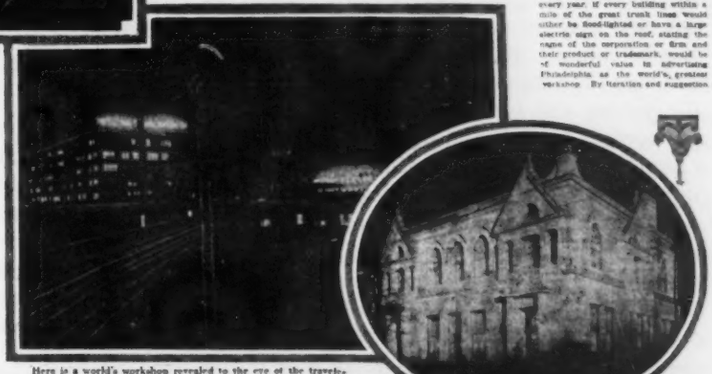
"I believe that if our large manufacturers would co-operate in the liberal use of electric signs, or would illuminate their buildings by the new flood-lighting method, it would do more to advertise Philadelphia to the outside world than any other means of publicity that we could use," said Mr. Calwell.

"We have wonderful manufacturing plants in Philadelphia, but the through traveler is not sufficiently impressed with this fact, nor with the names and trademarks of the diversified products in this district."

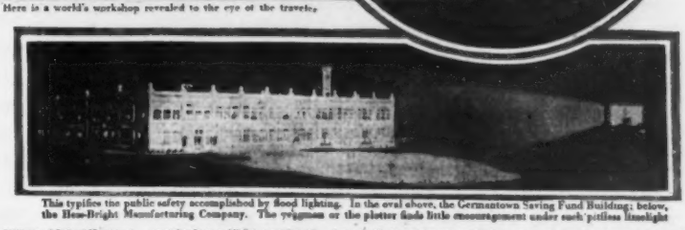
The promoters of this campaign say that the impression on the millions of people that pass through Philadelphia every year, if every building within a mile of the great trunk lines would either be flood-lighted or have a large electric sign on the roof, stating the name of the corporation or firm and their product or trademark, would be of wonderful value in advertising Philadelphia as the world's greatest workshop. By iteration and suggestion



The new Parkway will be a marvel of art indeed if all its new temples are lighted as is the Bell Telephone Building at Seventeenth and Arch streets



Here is a world's workshop revealed to the eye of the traveler



This typifies the public safety accomplished by flood lighting. In the oval above, the Germantown Saving Fund Building; below, the Hess-Bright Manufacturing Company. The ingenious or the plotter finds little encouragement under such pitiless limelight

"Advertise Your City by Night Illuminations"

By Charles S. Calwell

Chairman Publicity Committee, Philadelphia Chamber of Commerce

THE Publicity Committee of the Philadelphia Chamber of Commerce has become very much interested in the subject of factory illumination and electric signs, especially along the through lines of travel.

Among the hundreds of great industrial plants which are known throughout the country, located in this city, there are very few which advertise themselves at night. Electric signs or electric flood lighting would identify those national names with Philadelphia. This would be a gift to the city and at the same time a by-product through good advertising of the industrial plants themselves. These signs would be read not only by the traveling public going through the city, but also by the residents of Philadelphia, who are customers of virtually all these great industries.

If every manufacturing plant within the sight of the railroads could be illuminated at night it would make a greater impression on the visitors and the local citizens than could be obtained by any other means of publicity.

"LIGHT UP PHILADELPHIA" TO SHOW ITS POSITION AS "WORLD'S GREATEST WORKSHOP"

Successful lighting of Philadelphia during a period of "daylight darkness" suggested the great advertising and protective possibilities of electric light to Charles S. Calwell, president of the Corn Exchange National Bank in that city and chairman of the publicity committee in its Chamber of Commerce.

The result is that a great campaign for bright electric illumination at night is under way. In his statement in this article in the *Public Ledger*, Mr. Calwell says that electric signs or electric flood-lighting would identify the nationally known names of hundreds of industrial plants.

ILLINOIS COMMERCIAL MEN HOLD NEW-BUSINESS MEETING

Fundamentals of Selling Include Perpetual Service and Satisfaction with Every Transaction—Lighting, Wiring, Appliances and Cooking

The prearranged program of the Peoria meeting of the new-business co-operation committee of the Illinois State Electric Association on April 27 was of such length that the attempt at its completion prevented extended open discussion. The feature of the meeting was the luncheon address on "Salesmanship" by A. F. Siebert of the Dayton (Ohio) Insulating Die Company. It dealt with the fundamentals of selling without attempting specific application to the electrical business. It was considered by the delegates, however, an excellent analysis. It emphasized the necessity of perpetual service and satisfaction with every sale.

The paper on window lighting, by Norman B. Hickox of Chicago, discussed good show-window lighting and the methods of getting it.

The discussion brought out that central stations do not work out methods of securing window-lighting business with the same care which they give to residence lighting and power. Considerable interest was shown in daylight lamps. The best experience seemed to indicate that the combined use of daylight lamps and ordinary gas-filled lamps in alternate outlets gives the best results. This retains the advertising and daylight values of the colored lamp but eliminates the cold, lifeless effect.

In the paper on house-wiring by F. H. Scheel of Joliet, Ill., particular mention was made of the plan of the Public Service Company of Northern Illinois for promoting the sale and use of wall and floor outlets. The company has so changed its method of paying salesmen as to encourage the sale of extra outlets with house-wiring jobs, decreasing the commission on ordinary outlets and increasing it on wall and floor outlets. This made the average commission about the same as before, but promoted the sale of extra outlets.

The discussion showed great interest in the salary and commission plan of paying salesmen. It was estimated that $1.60 per wiring contract was the average commission paid by one company.

John G. Learned said that if prices of construction material maintained their present level companies might be forced to put more intensive effort on prospective business in the territory already served.

Electrification of Coal Mines

The paper on electrification of coal mines by Orlie Rue of Mattoon stated that complete electric service was feasible in any mine producing more than 200,000 tons of coal a year and electric hoisting in smaller mines producing 100,000 tons or more a year. The cost of electricity per ton of coal mined varies widely, but 2.5 cents per ton for complete electric service and 1 cent for electric hoisting can be taken as fair averages. This is a small part of cost when compared with 74 cents per ton paid miners.

The symposium on sale and upkeep of electrical merchandise was shortened for lack of time. E. C. Forest of Rockford discussed policies that a central station may follow in opening an appliance department.

Several speakers emphasized the necessity of appliance salesmen using devices in their own homes. It was urged that a liberal appliance repair policy be adopted.

Electric store arrangements were discussed by George E. Dunn of Oak Park.

Electric Heating and Cooking

In the symposium on electric heating L. H. Knapp of Chicago described low-temperature oven equipment.

B. G. Tarkington of Jackson, Mich., also took up heat treatment, brass melting and steel melting, and gave methods of getting this business and data on a few installations.

J. Paul Clayton of Mattoon said that in Illinois cities which now have no gas service there is a possible electric-cooking revenue of $3,600,000 annually, figuring $36 per family per year. In three years he expects to see $1,000,000 of that revenue accruing to central stations. He emphasized the necessity of having all employees use ranges. Mr. Clayton said that the best promotion work was that of providing ranges for church and lodge social functions and installing cooking equipment in high schools. The company has sixteen high schools equipped for electric cooking.

LARGE STEAM PLANT FOR CHICOPEE, MASS.

Turners Falls Power & Electric Company Will Erect Immediately Turbine Station of 120,000 Hp. Ultimate Rating

The Turners Falls Power & Electric Company has purchased 40 acres at Chicopee Junction, Mass., and will erect immediately a steam-turbine plant of about 120,000 hp. ultimate rating and a present rating of 40,000 hp.

The station will be a reinforced-concrete and brick structure, 350 ft. long by 250 ft. wide, and will be between the Boston & Maine Railroad and the Chicopee and Connecticut Rivers, assuring ample facilities for fuel and condensing-water supply. The plant will raise the total generating capacity of the Turners Falls company to 200,000 hp.

The system now operates plants of 20,000 hp. combined rating at Turners Falls, Greenfield and Mount Tom, besides a 40,000-hp. hydroelectric plant at Montague City, Mass., which was described in the Electrical World of April 21, 1917, page 740. Two additional units of 10,000 hp. each are now on order and will be installed at the earliest possible moment. The new steam plant will serve as a relay station for the central Connecticut Valley.

At present the company has two steel tower lines, each carrying two 66,000-volt, three-phase circuits, extending from Turners Falls to Amherst, and one two-circuit tower line from Amherst to Springfield, Mass. An additional two-circuit line will be built at once from Amherst to Springfield, and the company has purchased the right of way for a double tower line from the site of the new Chicopee station to the main transmission lines near the point where they cross the Connecticut River at Chicopee.

The demand for power has increased so rapidly that it has been found necessary to build the new plant eight years in advance of the time anticipated. The contract for building the station has been awarded to Fred T. Ley & Company of Springfield, Mass. Philip Cabot of Boston is president of the company. Offices have been opened in the Third National Bank Building in Springfield.

DALLAS CONVENTION OF THE SOUTHWESTERN ASSOCIATION

Attendance of 300 and Many Topics Affecting Central Stations Are Discussed—Loyalty to the President in War

The thirteenth annual convention of the Southwestern Electrical and Gas Association, held at the Adolphus Hotel, Dallas, Tex., on April 26 to 28, was attended by 300 persons.

At the opening meeting H. S. Slater, president of the association and general manager Texas Power & Light Company, Dallas, spoke on the need of efficiency and intelligent thought in utility management, now more imperative than before owing to the war crisis and the probability that a part of the central station employees would be called for military service. The education of the public as to its rights and to the utility's rights he considered to be of the greatest importance to the association members; for all business is based on confidence.

SUPPORT THE NATION

The following telegram was sent to the President:

> The members of the Southwestern Electrical and Gas Association, representing the street and interurban electric railway companies, gas companies, electric light and power companies and water-works companies of the Southwest, in full convention assembled, have unanimously pledged their support to the national administration in all its war measures and especially the selective conscription, and tender their services and the use of their properties to the end of the defense of the country.

A buffet dance was given to the visiting ladies, members and guests in the palm garden of the hotel by the Suppliers' Section.

FIRST ELECTRIC LIGHT AND POWER SESSION

The first electric light and power session, on the afternoon of Friday, April 27, was opened by an address on "Water Softening, the Free Work of the University on This Subject," by E. P. Schoch, professor of chemistry, Texas State University. He offered to co-operate with any central station in solving water-softening problems by testing water and designing softening plants. A study of Texas lignite beds will be made soon to see if they may be utilized as central station fuel.

In a talk on "Internal-Combustion Engines" J. C. Kennedy, manager electric department Benham (Tex.) Compress Oil & Manufacturing Company, gave his experience with steam-turbine and oil-engine power. He found the most efficient arrangement was to use the steam unit in the five months of heavy load when the mill was operated and the oil engines in the remaining time of light load.

"The Fallacy of the Comparison of Rates of Separate Public Utilities as a Basis for the Fixing of New Rates of Any One of Those Compared," by H. S. Cooper, secretary of the association, pointed out the mistake that is often made in trying to fix rates by comparison with those of similar companies.

Mr. Cooper has received many inquiries from central stations and outside municipal representatives for schedules of rates in cities about the same size as their own. He emphasized the fact that "local plants are strictly home products and subject to all the variations and increase in costs which local conditions will cause, and that once a community is made fully to understand and appreciate this point, a large amount of the utility's rate troubles have been brushed away. Also, if a community is made to understand and appreciate fully what these local conditions are and how they affect the cost of operation a still further amount of rate troubles will be eliminated. This presupposes, however, that the rates of the utility have been made on some equitable basis and give only a reasonable return to the utility."

A similar paper on the "Justice and Equity of Wholesale Rates," by H. O. Clarke, commercial agent Houston Lighting & Power Company, 1905, closed this meeting.

In the evening a Jovian rejuvenation followed by a cabaret was held at the Scottish Rite Cathedral.

SECOND ELECTRIC LIGHT AND POWER SESSION

In the Saturday morning session R. J. Irvine, general manager San Angelo Light, Water & Power Company, spoke on "Extension of Service by Public Utilities."

Among the "Economies in Central Station Operation," F. N. Lawton, manager Wichita Falls Electric Company, urged the installation of CO_2 recorders and draft gages on all boilers, stopping of air leaks in boiler settings, and the employment of high-class men for firemen. The fuel item is 75 per cent of the operation cost, and hence this should be guarded most carefully.

C. B. Roberts, betterment engineer Stone & Webster Engineering Corporation, said that CO_2 recorders were being used in its Texas properties on both oil-fired and coal-fired boilers with excellent results. He recommended the use of mechanical soot cleaners for boilers to prevent those heat losses estimated at 3 to 4 per cent from coal soot and 5 to 8 per cent from oil soot.

In discussing "Raw Light Versus Illumination," J. G. Barrett, illuminating engineer Texas Power & Light Company, stated that lighting was primarily a problem of two factors—light and eye. Sunlight being the perfect illumination, a good lighting system to approach this must have the characteristics of eye protection above all, then color value, efficiency, uniformity, diffusion and appearance. He believed that the great majority of central stations ignored the lighting problem entirely, and to the public a live new-business manager was more important than the manager, as the former was in reality a city builder. The empty socket, the unused porch light and the unshaded lamp were the signs of a "kilowatt peddler," not a salesman of service.

NEW OFFICERS

In the afternoon the nominating committee reported and the following were elected for the coming year: President, H. C. Morris, general manager Dallas Gas Company; first vice-president, D. A. Hegarty, president Texas Gas & Electric Company, Houston; second vice-president, W. A. Sullivan, manager Shreveport (La.) Railway; chairman executive committee, F. R. Slater, general manager Texas Power & Light Company, Dallas.

Industrial Heating as a Station Load

"Industrial Heating as a Central Station Load" is a booklet published by the Society for Electrical Development. Part 1, which has just been issued, deals with electric furnaces. Part 2, which is to be mailed on May 10, will give data as to various uses and applications of commercial electric heating, applying more particularly to the smaller cities.

DELEGATES TO THE CONVENTION OF THE PACIFIC COAST SECTION, N. E. L. A.

ENLARGED PUBLIC-POLICY PLAN FOR N. E. L. A. IS SUSPENDED

Success Assured by Contributions Well in Excess of the Figure Set, but National Service Comes First

The public-policy committee of the National Electric Light Association has decided that the efforts to raise funds for enlarging the public-policy work of the organization should be suspended on account of the national situation.

Money which has been received from members to be used in this work will be returned. Up to the present time the money received and pledged on this account amounts to approximately $75,000 per annum. The minimum sum which the committee felt would be necessary in order to assure the success of the plan on a satisfactory scale was $50,000 per annum. It is felt, therefore, that the members have responded in sufficient degree to indicate their hearty approval of the work.

In giving notice to members of the suspension of the plan, the committee emphasizes the fact that it is not because of lack of support that this action is taken but solely on account of the national situation. A letter addressed by the committee to members says:

"The public-policy committee met in New York on April 18 and, after thorough discussion, unanimously concluded that, in view of the present national situation, it is desirable that member companies concentrate all of their energies and resources upon the maintenance of reliable and efficient service in the public interest and upon the furtherance of co-operative plans with federal and local authorities for the successful consummation of our national war program.

"In furtherance of these ideas the committee recommended to the executive committee of the association the abandoning of the usual annual convention and the substitution of a meeting in New York of the company members for exchange of views and the formulation of action relative to the present situation.

"It was also determined to be advisable to indefinitely postpone further action with regard to the proposed program of enlarged activities of the association, as outlined in the letter of the public-policy committee addressed to the executives of the larger Class A companies under date of Feb. 14. In announcing this determination the members of the committee desire to express their very sincere appreciation of the prompt and favorable response received from a large proportion of such companies, whose definite subscriptions were more than sufficient to guarantee the carrying out of the plan had new conditions not arisen to render such action inadvisable in the opinion of your committee.

"For the reasons above outlined no call will be made for the present on the subscriptions received, and the payments already made will be returned by the treasurer of the association.

"We trust that the action of the committee in the above matters will meet the approval of the company members."

PATRIOTISM AND WATER POWER IN PACIFIC COAST MEETING

Use of Systems and Service Tendered to the Government—Legislative Conditions to Aid Water Power Development

In last week's issue the ELECTRICAL WORLD gave an account of the successful first convention of the Pacific Coast Section of the National Electric Light Association, held at Glenwood Mission Inn, Riverside, Cal., on April 19 to 21. The accompanying photograph of the members is convincing evidence of the support given by the Western coast members to their own organization and its work.

In addition to the full program of reports and papers the convention gave time to the consideration of patriotic and public measures. One resolution, showing that utilities are large factors in furnishing energy particularly for industrial establishments and for irrigation, tendered the use of the systems and service to the government "in protecting it in necessary transportation and in manufacture of munitions of war, in shipbuilding, the raising of foodstuffs and other necessaries of life." It also favored elective conscription.

In another resolution Congress was asked for water-power legislation under substantially the following conditions:

"That permits granted by the departments involved should not be of a revocable nature, but should be for a definite period of time—not less than fifty years—and shall not be forfeited, except by appropriate proceedings in a court of competent jurisdiction whenever the permittee shall fail to comply with the provisions of any act of Congress in relation to the matter; and that if the government elect to take over the property, at the end of the term of years leased, it shall pay to the permittee a just compensation therefor; that the charges or rentals for all lands used shall be determined by the average horse-power sold or used by the permittee for any purpose other than the operation of the plant."

DELEGATES TO THE CONVENTION OF THE PACIFIC COAST SECTION, N. E. L. A.

RATE CASE DISCONTINUED BY NEW YORK COMMISSION

"In Times of Unsettled Conditions the Necessary Margin of Safety for Utilities Should Not Be Curtailed"

The New York Public Service Commission, First District, has adopted an order and has approved an opinion by Commissioner Travis H. Whitney discontinuing a proceeding against the Bronx Gas & Electric Company in reference to electric rates.

The company serves with gas and electricity that part of the borough of the Bronx lying east of the Bronx River formerly known as the town of West Chester except the portion included in the limits of the former village of Williamsbridge, in which the Westchester Lighting Company operates. The commission has also pending an investigation into the rates of the latter company, a decision in which, however, has not been made.

The Bronx Gas & Electric Company charges a maximum rate of 12 cents per kilowatt-hour. Commissioner Whitney in his opinion, in which the other commissioners concurred, held that it was inadvisable at this time to order a reduction in the rates. His opinion said in part:

"At the outset of the hearings the company submitted a statement of facts and reasons in support of a 'request that the proceeding be dismissed or withdrawn by the commission,' and other parties who appeared were also heard upon this request. In exercising its discretion, upon facts, the commission does not make a finding as to whether the rate in question has been shown to be unreasonable—the burden of such proof resting upon the proponents—but simply determines whether it should continue the proceeding upon its own motion.

"Upon this question the argument presented by consumers and property owners of the territory served by the company preponderated against any action involving a possible reduction in rates. They contended that the public interest would be better promoted by conserving the earnings of the company under existing rates, so as to enable it to provide for much needed extensions in facilities and service which will not for some time be self-sustaining, than by a reduction in rates which would diminish the company's earnings and its ability to secure additional capital required for the extensions.

"It appears that the company is not as a whole earning an excessive return. Organized in 1895, no dividends were paid by the Bronx Gas & Electric Company until 1901, when 15 per cent was paid, and thereafter these dividends were paid: In 1902, 16 per cent; 1903, 5 per cent; 1904, 9 per cent; 1906, 1907 and 1908, 5 per cent; 1905 and 1909, no dividend; 1910, 1911 and 1912, 5 per cent, and 1913, 1914 and 1915, 6 per cent.

"The investment and operations of the company in the electric service should be segregated from those in the gas service in order to determine the reasonableness of the rates and the return to be allowed for the separate and independent services. It is not, however, necessary to enter into the minutiæ of such a segregation. The records of the commission indicate that a reduction in the general electric rate is not now warranted.

"Nor will the normal increase of business combined with the increase of consumption which usually follows a reduction in rates justify a finding that the effective rates are excessive. The operating figures for 1915 do not take into account the increase in the cost of labor and materials which has taken place during 1916 and 1917, which may be augmented as a result of the national exigencies arising out of the war with Germany. While it would be unjust to permit a utility to exact demonstrably excessive rates from consumers in order to transfer to them the burden of the taxation which must be borne as the material sacrifice in support of the contest by arms, yet in times of unsettled conditions the margin of safety necessary for the stability of public utilities should not be curtailed.

"If the convenience of gas and electricity is not made fully available, the development of the territory will be thwarted. If the company is enterprising and responsive to public needs and would share in its commercial prosperity, it must prepare to extend and enlarge its facilities in order to supply new and additional buildings. The prospects justify the company in making provision to anticipate the community's requirements. The extensions of line and service will not themselves immediately provide a return upon their cost, yet the commission may order these extensions to be constructed. Obviously, if the rate be reduced and surplus be eliminated, the early losses on the investment in extensions will not be absorbed.

"The principle that should govern is that the commission will consider carefully the necessity for a proper credit on the part of a public service corporation in order that it may comply with its affirmative obligations to render adequate service for the franchise territory at reasonable rates, with proper and safe equipment, and that the commission, in assuring itself that a company has reasonable protection for its ability to secure additional capital, will expect and require full compliance with all such affirmative obligations including extensions."

INSTITUTE OF RADIO ENGINEERS TO AWARD MEDAL OF HONOR

Annual Presentation to Be Made to Persons Who Have Rendered Distinguished Service in Radio Telegraphy and Telephony

The board of direction of the Institute of Radio Engineers has decided to award annually a "medal of honor" to persons who have distinguished themselves by unusual advances in the fields of radio telegraphy and

telephony. It has been felt that some way should be found whereby valuable work in these fields might properly be recognized by an authoritative engineering society.

The front of the medal is a symbolic representation of electromagnetic waves, indicating the interlinking of the magnetic and electric forces in their rapid path through space. The sculptor is Edward Sanford, Jr., New York.

The award will be made yearly at the April meeting of the institute to the person who in the two preceding calendar years shall have made public the greatest advance in the art of radio communication. The advance may be a patented or unpatented invention, but it must be completely and adequately described in a scientific or engineering publication of recognized standing and must be in actual, though not necessarily commercial, operation. However, preference is to be given to widely used and widely useful inventions.

The advance may also consist in a scientific analysis or explanation of hitherto unexplained phenomena of distinct importance to the radio art, although the application may not be immediate. Preference will be given to analyses directly applicable in the art. In this case also publication must be full and in approved form.

The advance, furthermore, may consist of a new system of traffic regulation or control, a new system of administration of radio companies or the radio service of steamship, railroad or other companies, a legislative program beneficial to the radio art, or any portion of the operating or regulating features of wireless. It must be described publicly in clear and approved form and must, in general, be actually adopted in practice. In all cases marked preference is to be given to advances made in the preceding year.

At least thirty days before the April meeting the board of direction will call upon members and fellows whom it may choose to consult for suggested candidates. This provision will be waived wholly or in part for 1917 only.

At its April meeting the board, through those actually present or voting by mail, will nominate at least one and not more than three candidates, in order of preference, for the award. These names will be sent to each board member, who will return a vote for one candidate. Four weeks after the April meeting the ballot will be read, and the candidate receiving the most votes will receive the award.

The official presentation to the successful candidate or his representative will occur at the May or June meeting.

ILLUMINATING ENGINEERING CAMPAIGN FOR NEW MEMBERS

Society Membership Co-operating in Movement to Interest Men in Fields of Illuminating and Allied Arts and Industries

A statement in regard to the membership campaign of the Illuminating Engineering Society has been received by the ELECTRICAL WORLD from C. D. Fawcett, assistant secretary of the society. Mr. Fawcett says:

"The professional man has an interest in the society since it affords a direct approach to special knowledge on all lighting subjects. The architect, teacher, research scientist, illuminating engineer and physicist have an outlet for their opinions in the society's *Transactions* and before the several sections of the society which hold monthly meetings.

"The membership at large have been asked to cooperate during the course of the campaign. Individual application to those men in the several fields of illuminating and the allied arts and industries is the method emphasized. Many of these men are seeking information on one or another subject of illumination of direct bearing on their daily work. The electrical contractor, gas and electric fixture manufacturer, glassware manufacturer and salesman in these branches are continually confronted with new phases of illumination not previously available in any printed matter. The society attempts to publish up-to-date papers on these subjects. The papers deal with the manufacturing, physical, psychological, technical and fundamental aspects of illuminating engineering.

"Thus far the campaign shows encouraging results. It has been found that the average prospective member has been seeking the benefits which the society offers but has not previously been brought in contact with the development in this specialized field."

General Electric Company Gardens

The General Electric Company has loaned unoccupied land to employees for garden purposes. There are about 60 acres of rich river-bottom land at Schenectady west and south of the company's plant.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public-utility companies.

Supreme Court May Affirm or Set Aside Orders of Commission, but May Not Revise or Modify Them.—Under an act concerning public utilities, the Supreme Court has jurisdiction to review the orders of the Board of Public Utility Commissioners and to set aside or affirm the orders in toto, but the Supreme Court has no power under said act either to revise or modify an order of said board, was the decision of the Court of Errors and Appeals of New Jersey (100 A-346).

Necessity of Bidding for Municipal Street-Lighting Contract.—A city charter requirement that contracts for "work," "including printing," should be let to the lowest bidder is inapplicable to a street-lighting contract, especially since the rate charged is constantly subject to the Railroad Commission's supervision under the public utilities law, according to the Supreme Court of Wisconsin in Oconto Electric Company versus People's Land & Manufacturing Company (161 N. W. 789). Where an electric lighting company's bid did not designate which schedule of service it would give but it later advised the Council that it would give either of two services the Council might elect, one of which the Council accepted, it was held that the contract was valid, and upon filing with the Railroad Commission the rate became enforceable and presumptively reasonable.

Indeterminate Permits.—Where a Wisconsin corporation was doing a commercial electric lighting business when the public utilities law became effective and continued to do so, it secured an indeterminate permit for such lighting, the Supreme Court of Wisconsin held in Oconto Electric Company versus People's Land & Manufacturing Company (161 N. W. 789). A franchise granted in 1904 for furnishing lighting to a city's inhabitants to a corporation doing a commercial lighting business until 1909, when it also did street lighting, became an indeterminate permit for street lighting under the law, transforming into such permit every license, etc., granted prior to July, 1907, although the 1904 franchise was ineffectual as a legal grant, because the company's articles of incorporation were not sufficiently comprehensive. Where a franchise for electric lighting granted by a city was assigned and later taken over by a company which gave the street lighting to another concern and later took an indeterminate permit under the public utilities law, it was held that its rights, although imperfect in inception, were exchangeable for a valid indeterminate permit for both street and commercial lighting. The provision of the public utilities law that no public utility shall exercise a lighting privilege suspended for more than a year without obtaining a certificate of convenience and necessity is not retroactive. The provision that no public utility shall exercise lighting privileges where suspended for more than one year without obtaining a certificate of convenience and necessity refers to voluntary suspensions and is inapplicable to a suspension caused by a rival concern obtaining a franchise for a year's street lighting. An electric lighting company did not abandon its permit for street lighting by not submitting bids where it reasonably considered the Council's specifications designed to exclude it and upon a rival securing a contract for five years sold such rival the street-lighting equipment it could not use for commercial lighting.

Court Instructions Regarding Assumption of Risk and Due Care.—Instruction directing verdict for employee's death upon finding specified facts, regardless of employee's knowledge of danger in working near high-voltage electric wires, was erroneous either under common law or employers' liability act, since the doctrine announced was contrary to common-law rule and did not set forth facts to bring it under the statute which abrogates the doctrine of assumption of risk in certain cases, but, since the undisputed evidence showed that the employee was directed to do dangerous work, in which case the law eliminates assumption of risk, such instruction could not have harmed defendant, it was held by the Supreme Court of Indiana (115 N. E. 577). An act permitting employee's recovery for personal injuries in certain cases, although he knew or could have learned of the danger, modifies the common-law rule of assumption of risk. Instruction in action for employee's injury, charging that it was employer's duty to keep high-voltage wires "perfectly" insulated and use "utmost" care in maintaining them, was held erroneous as charging more than reasonable care required. Instruction authorizing recovery for employee's personal injury if high-voltage wires were "imperfectly insulated" was erroneous, since defendant was not liable unless defect was due to want of reasonable care or discoverable by exercising such care and was not an insurer of perfect insulation of its wires. The "duty to use due care" is absolute, certain and unchanging and a question of law, but acts, precautions and conduct necessary to constitute "due care" are relative and variable and questions of fact in the particular case. It is the employer's duty to use reasonable care for his employee's safety, whether the business is comparatively safe or extremely dangerous, but the acts of care necessary are to be determined from consideration of dangers incident to use of agency employed as well as to the circumstances and inherent conditions. The law fixes no different standard of care for those using high-voltage electricity from that for any other business, but the same duty exists to use reasonable care under the particular circumstances.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Municipal Service Extensions When Financial Condition Is Poor.—A decision of the Wisconsin Railroad Commission, affecting the city of Spooner, says: "A municipal water utility will not be required to make an extension where the net return therefrom will be less than interest on borrowed funds for the cost and the city is in poor financial condition and needs money for other public improvements."

Discontinuance of Service.—In a decision dismissing a complaint against the New York Edison Company the New York Public Service Commission, First District, holds: "An electric company may require a tenant in an apartment house to which service is furnished through a general riser owned and controlled by the landlord to agree to a duly filed and published provision in a standard contract that, if the company is obliged to discontinue service to the building for any cause, the tenant will not request service 'through a sub or series meter,' since the company cannot lawfully change the contract or accept an alteration without previously filing and publishing the same so that all consumers may have the benefit. A statement added by an applicant to his service contract that he signs under protest reserving the right to attack the legality of a provision is ineffective, since the contract is made in contemplation of the regulatory power of the commission."

Extra-Hazardous Business Recognized in Ohio.—In upholding an appeal of the Ashtabula Gas Company against a rate of 30 cents per 1000 cu. ft. for natural gas, fixed by city councils of three communities, the Ohio Public Utilities Commission declared that a corporation engaged in producing and distributing natural gas should have a return of not less than 10 per cent on the invested capital. The commission made a rate of 34 cents with a service charge of 20 cents a month per meter. The commission says: "The natural-gas business differs materially from that of any other which is classed as a public utility. Its production is in the nature of a mining venture. It can be produced only in limited areas and when once discovered it is only by continuous mining that the extent of the field can be ascertained and the supply maintained. Telephonic communication and railway transportation may be indefinitely carried on anywhere. But natural gas is limited to comparatively few localities and the life of the enterprise depends upon the uncertain supply of nature. Experience has taught that at the best a natural-gas field cannot last longer than two or three decades."

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Launching of the New Mexico.—The superdreadnought New Mexico was launched at the Brooklyn Navy Yard on April 23. Directly afterward it was taken back to the yard and the work of preparation for active service was begun. It will be the first dreadnought to be electrically propelled.

Utilities Bureau Election.—At the annual meeting of the Utilities Bureau, Philadelphia, Charles R. Van Hise was elected president. Rudolph Blankenburg, former Mayor of Philadelphia, and F. H. Newell, professor of civil engineering of the University of Illinois, were made trustees to fill vacancies.

Powerful Radio Station for Philadelphia.—An official announcement says that preliminary construction of one of the most powerful wireless stations in the world has been begun at the Philadelphia navy yard. The station will have a sending radius of approximately three-fourths of the distance around the globe.

Incorporation in Venezuela.—The business of Angarita & Company, formerly proprietors of the Empresa de Alumbrado Electrico de San Cristobal, Venezuela, was incorporated recently as a joint stock company, Energia y Luz Electrica de San Cristobal, and the shareholder. J. Manuel Angarita, will be in charge of the affairs of the new company.

New Tax Laws in Kentucky.—By the provisions of laws enacted at a special session of the Legislature, Kentucky hereafter will classify property for taxation purposes, instead of making use of the old system of a general property tax. A commission is created with supervisory powers and it will assess public service corporation franchises and property for taxation.

State Control Upheld in Illinois Case.—A decision has been rendered by the Illinois Supreme Court holding that the State Public Utilities Commission has jurisdiction over utilities in Chicago. It follows an appeal from the decision of Judge Taylor of the Circuit Court, Chicago, denying the authority of the commission to issue orders affecting service and equipment of Chicago electric railways.

Large Utility Earnings.—Reports of 325 public utility corporations to the *Financial World* show for 1916 a total gross revenue of $1,223,006,181, an increase of $227,945,649, or 29.25 per cent over 1915. Net earnings were $550,920,933, a gain of $158,171,953, or 20.24 per cent over 1915. The companies have $2,864,325,700 outstanding bonds, $963,377,500 preferred stock and $2,506,637,835 common stock.

Platinum Refining in 1916.—Preliminary estimates based on practically complete returns made to the United States Geological Survey, Department of the Interior, by domestic refiners of platinum indicate that in 1916 approximately 488 ounces of domestic crude platinum (about 74 per cent metal) were refined, producing 172 ounces of platinum, 84 ounces of iridium, and 113 ounces of iridosmine, and that 10,118 ounces of South American crude platinum, about 88 per cent pure, were refined.

The Electric Vehicle as a Carrier of Explosives.—A. Jackson Marshall, secretary of the Electric Vehicle Section of the National Electric Light Association, calls attention to the value of the electric vehicle in the transportation of explosives. He says: "The electric vehicle is particularly adaptable because of its lack of fire danger and its fixed maximum speed and easy control, which lessen the chance of collision. These electric trucks are used in New York City by a large manufacturer of explosives, and are accepted by the bureau of combustibles of the New York Fire Department as the safest means of transporting explosives through the city streets."

Export Situation Discussed Before St. Louis Jovians.—At the luncheon of the St. Louis Jovian League on March 27, D. S. Kramer, head of the export department of the Century Electric Company, St. Louis, delivered an address on trade conditions in foreign countries. Mr. Kramer had just returned from an extended tour of the world. He stated that some of the British manufacturers, in their attempt to supply inexpensive electric motors like those furnished by the German manufacturers before the war, had designed motors along similar lines. He pointed out the fact that American manufacturers would do better to build a reputation for reliable apparatus at consistent prices than to compete with the low prices of inferior-quality motors. R. J. Russell, secretary of the Century Electric Company, presided as chairman of this meeting.

Increased Costs Overcome in Part by Larger Gross.—In the statement covering the period of twelve months ended March 31, 1917, the American Light & Traction Company, through Alanson P. Lathrop, the president, says: "This company, in common with others, is experiencing a period of high operating costs, due principally to unusual conditions prevailing in the labor and material markets, and to the increased taxes. Fortunately these abnormal operating costs are offset to some considerable extent by the very satisfactory increases in gross business, these increases in volume being, in nearly every instance, the largest the subsidiary companies have ever experienced. The increased gross for March is $179,939, or 14.5 per cent; for the three months ending March 31, $471,471, or 12.35 per cent, and for the twelve months ending March 31, $1,682,177, or 11.69 per cent. This expansion of business promises well for the future and for the time when operating conditions return to a more nearly normal basis."

Associations and Societies

The Directory of Electrical Associations, which is regularly printed in the first issue of each month, appears on page 879 of this number.

Lafayette College Branch of A. I. E. E.—The student branch of the American Institute of Electrical Engineers at Lafayette College held a meeting on April 19. The subjects of the papers presented were "Elementary Principles of Light and Lighting," by E. E. Tanzer, instructor in illumination, and "The History of the Manufacture of Incandescent Lamps," by Dr. J. T. Rood, head of the electrical department.

Missouri Association of Public Utilities.—The entertainment committee of the Missouri Association of Public Utilities has arranged to have its annual convention on board the steamer Quincy. The convention will be held May 17, 18 and 19. The boat will leave St. Louis on May 17 at 9.30 a. m., run to Cape Girardeau and return. The details of the program have not yet been fully arranged, but will be announced later in these columns.

Hudson County (N. J.) Electric Club Organized.—The electrical contractors of Hudson County (N. J.) met at Jersey City, N. J., on April 18, and organized the Hudson Electric Club. The following officers were elected: President, H. J. Reitze, Jersey City; first vice-president, A. L. Hildner, Weehawken; second vice-president, H. A. Schuller, Bayonne; third vice-president, Samuel Cross, Hoboken; secretary, William Doellner, Jersey City; treasurer, Frank B. DeWitt, Jersey City; sergeant-at-arms, B. Moser, Jersey City. The object of the club is to hold regular meetings at least once a month, when subjects of interest will be discussed and in most cases a speaker secured for the evening. Membership is open to any one connected with the electrical industry.

Recent Applications of Electricity in the Steel Industry.—The Philadelphia Section of the Association of Iron and Steel Electrical Engineers held its regular monthly meeting on May 5, at which meeting G. E. Stoltz of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., spoke on some recent applications of electricity in the steel industry. Mr. Stoltz briefly outlined the more recent developments in the application of electric motors in the steel mill, such as the use of the Illgner system to drive a 28-in. (70.7-cm.) three-high structural mill, in order to accomplish the rapid changes in speed found desirable. The recent tendency toward large turbine units in the steel plant was also brought out and a comparison was made of 25-cycle and 60-cycle generating economies. The broadening field of the central station in supplying power to steel mills was also discussed.

JOHN G. BARRY

Men of the Industry

Changes in Personnel and Position—Biographical Notes

H. F. JACKSON

John G. Barry of Schenectady has been appointed general sales manager of the General Electric Company. Mr. Barry has long been manager of the company's railway department, the duties of which he will continue to exercise. He began his business career as production clerk for the Thomson-Houston Company at Lynn, Mass., in 1890. Soon, however, he was transferred to the company's Boston office in the commercial department. In 1892 the Thomson-Houston Company and the Edison General Electric Company were united to form the General Electric Company, and two years later Mr. Barry was transferred to Schenectady, where, in the railway department, he soon became assistant manager and in 1907 manager.

Robert Lindsay, vice-president and general manager of the Cleveland Electric Illuminating Company, has been elected a director and member of the executive committee of the Republic Railway & Light Company.

William D. Ray, for the past two years vice-president and general manager of the Pennsylvania Utilities Company at Easton, Pa., was on April 17 tendered a banquet at the Pomfret Club, Easton, by a number of his friends among the leading business and professional men of the city, upon his retirement from active charge of the electric and gas properties at Easton. Following several complimentary speeches, Mr. Ray was presented with a gold watch as a token of the esteem of the community.

H. C. Morris, general manager of the Dallas (Tex.) Gas Company, was elected president of the Southwestern Electrical and Gas Association at its annual meeting in Dallas on April 26-28. He was born in Detroit in 1879 and entered the service of the Detroit City Gas Company in 1898. For two years following 1902 he was superintendent of the Saginaw (Mich.) City Gas Company, and thereafter until 1908 he acted as assistant general manager of the Bay City Gas Company and the Bay City Traction & Electric Company. He then went to Dallas as superintendent of the company he is now with and later was made general manager.

O. R. Sturzinger, superintendent of the Northwestern Ohio Railway & Power Company, Toledo, Ohio, has resigned, and the office has been abolished.

Ernest Vanarsdel has resigned from the Kentucky Utilities Company, where he was in charge of operation, to become connected with the operating department of the Interstate Public Service Company at Indianapolis.

E. E. Nelson, for the past eleven years electrical engineer for the Northern Texas Traction Company, Fort Worth, Tex., has resigned to become connected with the Adirondack Electric Power Corporation, Utica, N. Y.

J. E. Wilson of Boston has been appointed secretary of the Electrical Contractors' Association of Massachusetts to fill the vacancy caused by the death of Henry D. Templex. Mr. Wilson was formerly special representative of the association.

Walter Alexander has resigned as chairman of the Wisconsin Railroad Commission, effective May 1, to accept the position of superintendent of motive power of the Chicago, Milwaukee & St. Paul Railroad Company. Mr. Alexander was appointed a member of the Wisconsin Railroad Commission a little more than two years ago, to succeed David S. Harlowe. At that time he was master mechanic of the Chicago, Milwaukee & St. Paul Railroad Company. No successor to Mr. Alexander has as yet been named.

Joseph Pratt, for the last twelve years employed by the Woonsocket branch of the Blackstone Valley Gas & Electric Company, has resigned his position as superintendent of outside distribution and has accepted a position as salesman with the Boss Electric Supply Company of Providence. Mr. Pratt entered the employ of the lighting company as office boy and was later made assistant in the stock rooms, from where he was transferred to the inside-wiring department. When the concern ceased to contract for house wiring he was put in charge of the trouble and meter department, a position he held until last fall, when he was made superintendent of outside distribution.

H. F. Jackson, newly elected president of the Pacific Coast Section, N. E. L. A., was born in Kansas City, Mo., in 1871. At the age of twenty-one he was appointed to the United States Military Academy at West Point, from which he was graduated with the class of 1896. He was detailed with the regiment at Newport, R. I., until the fall of 1898, when he went to Cuba for service during the Spanish-American War. From 1898 to 1901 he served with General Fitzhugh Lee and General Leonard Wood in various staff capacities and during this time gained a wide variety of experience. His responsibility at times extended over some 15,000 men. He became acting chief engineer of the Seventh Army Corps, captain and acting judge advocate, Department of Western Cuba, and served with General Gorgas in camp location and general sanitary work. G. F. Greenwood of the Havana Electric Railway induced Mr. Jackson to secure a leave of absence from the army in the latter part of 1900 to take charge of the railway system and in the capacity of assistant general manager. Mr. Jackson managed these properties for one year. In 1901 he was appointed a member of a board of three officers to plan and carry out army and navy maneuvers in connection with the defenses of Portland, Me. This work called for the co-ordination of various government departments involving pioneer work along this line, which culminated in the highly successful maneuvers carried out in 1903. Mr. Jackson then attended the government school of submarine defense, from which he was graduated in 1904, and was immediately detailed as the first army officer to take up instruction at the General Electric Works in Schenectady. In 1905 he became artillery engineer of defenses at Old Point Comfort, Va., whence he was transferred to Washington, D. C., as assistant to the chief of artillery. Mr. Jackson resigned from government service in 1906, with the idea of rounding out his training by experience in civil life. Since that time he has been identified with the construction and operation of the Stanislaus hydroelectric development, working up through the ranks to be general manager, and recently to the position of president of the Sierra & San Francisco Power Company and the Coast Valley Gas & Electric Company. During this time he has controlled the expenditure of about $11,000,000, at times directing the work of some 1500 employees. Captain Jackson reported to Washington by telegraph at the outbreak of the war to place at the government's disposal such service as it might be considered that his training qualifies him to render.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

FIRM UNDERTONE IN JOBBING CONDITIONS

Little Change During Past Month, Collections Somewhat Better, Prices on Iron Conduit Higher, Insulated Wire Lower

Jobbing conditions throughout the United States, according to the regular reports received by the ELECTRICAL WORLD, show little change from last month in spite of the existing state of war. With the exception of New England, the entrance of this country into the war has had little apparent effect on the electrical trade. New England jobbers are using telegraph and telephone facilities more than ever before in the effort to meet the increasing business due to the war. Preferential shipments based on bona fide war order or allied business are being handled with appreciation of their importance by the railroad interests. Some war order jobs are being taken by jobber contractors on a "cost-plus" basis.

Prominent jobbers feel that the entry of New England into active manufacturing of wooden munition and food carriers for overseas trade to offset the losses of vessels resulting from the submarine campaign will bring increased prosperity to the coastal sections and indirectly stimulate the demand for electric service. The need of closer cooperation between the government and manufacturing interests has been emphasized, notably along the line of permitting plants to continue their normal industrial output up to the latest possible moment before taking on preferential governmental contracts, some delays having occurred due to shutdowns ordered to take place before the plants were actually given the word to start production on military or quasi-military material. By subdividing government orders much work can be handled flexibly and rapidly with minimum interference with regular industrial needs.

LITTLE CHANGE IN PRICES

Prices are for the most part stationary. Iron conduit has advanced considerably, while insulated copper wire in large lots has softened somewhat. Iron conduit in two years has advanced over 100 per cent. In the past month it increased per hundred almost $1.

There has been little change in the condition of stocks during the past month. Generally they are large and ample. Stocks in which the price of copper wire is a dominant factor, according to an Eastern report, such as insulated wire, knife switches, etc., are rapidly diminishing and are relatively low as compared with a year ago. The most notable feature in stock movement on the Pacific Coast is that in practically all lines the number of turnovers has increased; that is, where the rate last year was three and a half turnovers it is now four and a half.

In the Middle West delayed deliveries are still forcing the jobbers to keep on hand wherever possible a stock larger than normal. Jobbers' customers in this section are carrying practically normal-size stocks, so that a large percentage of the business the jobber handles consists of material that is to be used immediately.

Volume of buying is still large, although there has been an appreciable slowing up in some directions. In some instances jobbers find it advisable to buy from hand to mouth, following the example of customers. There has been a marked falling off in many lines purchased for retail consumption. Decreased building has been responsible for this in many centers. For wholesale consumption, however, it is reported that business is still as brisk as ever.

An unusually heavy demand for electric motors, cable and flood-lighting equipment is a feature of the present situation in New England. Deliveries cannot be said to have improved much, and the pressure upon the manufacturers is now so great in industrial supply lines that it is practically hopeless to expect anything like early deliveries on non-standard equipment. Transportation difficulties continue to handicap the movement of goods, but perhaps to a less degree than a month ago. Jobbers allied with electrical contracting interests are doing all they can to adapt equipment for temporary industrial service, especially in the motor field, where approximate sizes, combinations of motor types, pulley adjustments and modifications, etc., must be made to provide the solution for many local power situations. A prominent central station man remarked last week that he could dispose of a thousand dollars' worth of motors every seven days if he could obtain them, and in some localities a rushing business is being done in the reconnecting of induction motors for higher or lower voltage service. Price is no object in many of these motor installations at present, speed of installation being the *sine qua non*.

APPLIANCE DEMAND OFF IN NEW ENGLAND

As for appliances, it is feared that the demand for these in New England may not attain the desired volume unless the tendency toward hysterical parsimony is counteracted by a more intelligent appreciation on the part of the public that so far as possible the tide of general business must flow full under war conditions no less than in peace. Some prospect exists that prices of appliances may go lower if overstocking becomes acute. A good start is being made on fan motor business.

The volume of buying during the next thirty to ninety days in the Middle West will, of course, depend on general business conditions. If prices remain firm, jobbers will expect no let-up in business. If prices weaken business will fall off, since the trade declines to buy on a falling market. There is a divergence of opinion as to the extent of business which may be expected from industrial plants. A few think industrial-plant expansion has reached its zenith; others believe that manufacturers will succeed in getting a part of the $7,000,000,000 the government will spend and that this must of necessity make for sound business conditions. A rumor is abroad in the trade that a Detroit company has already secured an order for 100 carloads of conduit and 250 100-kw. generators to be used in shipbuilding. The most noticeable demands are, of course, for the things which the jobber finds hardest to get. The lamp situation is still bad and the inability of the manufacturers to supply the jobbers is accredited to a combination of causes, including cessation of foreign shipments, extraordinary demand, and difficulty with the glass situation. Motors, transformers and conduit, which come from the East, are very much delayed by railroad embargoes. Telephones are almost impossible to get. Some jobbers find that magnet wire and stranded wire are hard to get and report that the mills are drawing only the larger sizes. The effect of the "wire-your-home-time" campaign has made itself felt to some degree, so that there has been a demand for wiring devices and some socket appliances. Jobbers who are carrying automobile specialties are, of course, experiencing a seasonable increase in this class of goods and look for a good year unless gasoline goes to more than 30 cents a gallon. At present it is the general feeling that the current year to date has produced a business above normal and that a continuation of good times may be expected.

Buying on the Pacific Coast will be, as heretofore, conservative and careful. However, the jobbers have found it advisable to order farther ahead than heretofore, charge to be made for goods at market price on date of delivery. This eliminates the gambling element in advance orders

and at the same time gives the manufacturer advance notice of requirements.

Plant and line equipment has been in demand in south Pacific Coast territory. Wire in system extensions and shipyard work has marked the Northwest trade. The most active demands are in the industrial and government fields. Contractors' business is about par.

During the last two weeks buying has been considerably heavier in the Northwest, on account particularly of steel advances. The orders being placed now call for early fall delivery. Many of the larger houses in that vicinity are trying to cover for months ahead, but are being held back by uncertain freight conditions which show no signs of improving. Demand continues about the same. The bulk of the business is being carried on with the shipbuilding concerns in the large cities of the Puget Sound country, which are rushed to capacity. An increase in demand from the shipbuilding firms, due to the wooden-ship-building program announced by the United States government, is anticipated. Supply dealers are making all preparations possible to care for the increase.

A heavy demand in wiring materials has been felt in the South, especially for textile industries.

Credits and collections have shown little change during the past month, what change there was being generally better. Less speculation has been noted and therefore a falling off somewhat in credits.

In the Southern districts that were visited by the boll weevil collections are not good. In certain counties whole communities are practically destitute; merchants in the towns dependent on these communities having sold a considerable volume of their stock are without means of replacing same, and in some instances small country stores may be found with shelves almost entirely empty. The condition in these sections is very serious and steps are being taken by public-spirited citizens to furnish these destitute farmers with sufficient seed to make their crops this year. In such communities, which are situated principally in what is known as the hill country of Mississippi, it is almost hopeless for jobbers to collect past-due accounts until better conditions are created.

In the Middle West credits and collections for a time slowed up with some jobbers, the slowing up being attributed to the difficulty jobbers' customers had for a short time in collecting from their customers. This period, however, seems to be passed so that credits and collections are now about normal.

The war has had little effect in the Far West in shortening terms or restricting credits to regular customers. The trade acceptance plan in the Northwest is working well, no defaults having yet been reported. There is plenty of money in evidence.

CANADIAN MARKET FOR FOREIGN ELECTRIC GOODS

Statistics for Year Ended March 31, 1916, Show a Marked Falling Off in Imports—All Countries Affected

Statistics have recently been issued showing the import trade of Canada for the year ended March 31, 1916, compared with that for the previous year. With the exception of carbons, all of the strictly electrical material listed showed a decreasing value of imports for the 1915-1916 period over the 1914-1915 period. Imports of copper wire dropped from $25,000 to $18,000; incandescent lamp bulbs from $70,000 to $63,000; insulators, batteries, telegraph and telephone instruments from $4,344,000 to $3,582,000; motors, generators and dynamos from $1,249,000 to $901,000. The increase in carbons was from $44,000 to $52,000.

While in the 1914-1915 period, which included the four months previous to the war, the imports were from almost all of the principal nations of Europe, since that time practically the entire electrical imports to Canada have been supplied by the United States and Great Britain. The British trade in purely electrical goods fell off from around $700,000 to a little more than $200,000. The imports of American electrical goods dropped from around $5,000,000 to a little more than $4,300,000.

THE DAY OF THE SMALL ELECTRICAL MANUFACTURER

He Is Receiving the Overflow Business from Larger Concerns and Thereby Laying Foundation for Larger Business in the Future

Without a doubt this is the day of the small electrical manufacturer. Orders are coming his way that ordinarily he would not even have an opportunity to bid on. Now, however, the large manufacturers are sold out and orders are taken only on the understanding that it will be a long time before the goods are delivered. The overflow trade, therefore, is going to the small manufacturer who is in a position to turn out a limited amount of goods in less time than it would take the larger manufacturer. It has been estimated that 50 per cent of the orders received by the smaller manufacturers are orders that the large manufacturers cannot handle.

Because of the smaller overhead and less complex organization and routine of the small manufacturers their profits have undoubtedly been larger proportionately than have those of the large concerns. It has been estimated that the routine cost per order for the large manufacturers is in the neighborhood of $25.

The smaller manufacturers, being as a rule specialists on some one class of goods, furnish a product that generally is excellent. In order to compete their article must be sold on a quality basis with emphasis on special features.

Consequently the small manufacturer of electrical equipment views the present with the utmost satisfaction for two reasons: First, his business is larger and more profitable than ever, and second, he has accumulated a large list of customers whom he probably never would have served except for such unusual conditions.

METALS MARKET IS FOR THE MOST PART QUIET

Lead and Iron Products Advance Under Large Demand—Little Buying in Other Metals—Copper Quotations Nominal

With the exception of iron and lead, the metals markets continue dull. There is no demand to speak of, and what buying there is is spot and in small quantities. Copper prices hardened somewhat at the beginning of the week on rumor of heavy foreign inquiries. At present the market seems stagnant. Nominal quotations on Tuesday for electrolytic were as follows: May, 31.25 cents; June, 30.25 cents; third quarter, 26.5 cents; fourth quarter, 25.5 cents.

The market for tin stays quiet. London prices are higher in expectation of American demand. Imports continue light.

Spelter market is quiet but firm. Demand is small.

Lead prices are advancing under a heavy demand.

Iron and steel continue to advance. Prices for iron pipe are expected to go six to eight points higher before the week is out.

NEW YORK METAL MARKET PRICES

	April 24 Selling Prices Bid	Asked	May 1 Selling Prices Bid	Asked
	£ s d		£ s d	
Copper:				
London, standard spot	130 0 0		130 0 0	
Prime Lake	30.50	to 31.00†	30.50	to 31.00†
Electrolytic	30.00	to 31.00†	31.00	to 31.50†
Casting	26.75	to 27.25†	27.50	to 28.50†
Copper wire base	37.50	to 38.00†	36.50	to 37.50†
Lead	9.00		9.00	
Nickel	50.00		50.00	
Sheet zinc, f.o.b. smelter	21.00		19.00	
Spelter, spot	8.92½	to 9.17½	9.55	to 9.67½
Tin, Straits	57.50†		58.50	
Aluminum, 98 to 99 per cent.	56.00	to 58.00	56.00	to 58.00

OLD METALS

Heavy copper and wire	25.50	to 26.50	25.50 to 26.50
Brass, heavy	16.00	to 16.50	16.00 to 16.50
Brass, light	12.00	to 12.50	12.00 to 12.50
Lead, heavy	7.50	to 7.75	7.50 to 7.75
Zinc, scrap	6.25	to 6.50	6.50 to 7.00

†Nominal.

Current Prices of Electrical Supplies

The prices quoted are those prevailing in standard package or specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists to contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East, its nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers.

RUBBER-COVERED WIRE N. C.

Solid-Conductor, Single-Braid

	Price per 1000 Ft. Net					
	Less than 500 Ft.		500 to 1000 Ft.		1000 to 5000 Ft.	
No.	Chicago	N. Y.	Chicago	N. Y.	Chicago	N. Y.
14	$18.00	$18.00	$16.00	$14.50	$14.00	$12.50
12	29.89	29.71	25.62	25.30	21.35	18.60
10	41.51	41.16	35.58	35.28	29.65	25.87
8	60.13	59.64	51.54	43.12	42.95	46.28
6	82.20	94.71	75.35	81.18	68.50	59.53

ANNUNCIATOR WIRE

Per Lb. Net	Chicago	N. Y.
No. 18, less than full spools	$0.65	$0.45¼
No. 18, full spools	0.56	0.44¼

WEATHERPROOF WIRE

Solid-Conductor, Triple-Braid, Sizes 4/0 to 8, Inc.

Per 100 Lb. Net	Chicago	N. Y.
Less than 25 lb	$45.00	$43.25
25 to 50 lb	44.00	42.25
50 to 100 lb	43.00	41.25

LAMP CORD

Cotton-Covered, Type C, No. 18

Per 1000 Ft. Net	Chicago	N. Y.
Less than coil (250 ft.)	$38.16	$35.77
Coil to 1000 ft	28.62	27.18

PIPE FITTINGS

Conduits, V.V., Unilets and Similar

Discount	Chicago	N. Y.
Less than 1/5 std. pkg	25%	25%
1/5 to std. pkg	32%	32%
Std. pkg.	40%	40%

RIGID IRON CONDUIT, CARD NO. 37

Conduit, List, per Foot

Size, in.	Chicago	N. Y.
¼	$0.08½	$0.08½
⅜	.08½	.08½
½	.08½	.08½
¾	.11½	.11½
1	.17	.17
1¼	.23	.23
1½	.27½	.27½
2	.37	.37
2½	.58½	.58½
3	.76½	.76½

COUPLINGS AND ELBOWS, CARD NO. 37

	Couplings, List, Each		Elbows, List, Each	
Size, in.	Chicago	N. Y.	Chicago	N. Y.
¼	$0.05	$0.05	$0.19	$0.19
⅜	.06	.06	.19	.19
½	.07	.07	.19	.19
¾	.10	.10	.25	.25
1	.13	.13	.37	.37
1¼	.17	.17	.45	.45
1½	.21	.21	.60	.60
2	.28	.28	1.10	1.10
2½	.40	.40	1.80	1.80
3	.60	.60	4.80	4.80

	Discount, ¼ In. to ½ In., Per Cent		Discount, ¾ In. to 3 In., Per Cent	
	Chicago	N. Y.	Chicago	N. Y.
Less than 2500 lb	13.8	20	15.8	22
2500 to 5000 lb	16.8	23	18.8	25

(For galvanized deduct six points from above discounts.)

NON-METALLIC FLEXIBLE CONDUIT

	List, per Foot.			List, per Foot.	
Size, in.	Chicago	N. Y.	Size, in.	Chicago	N. Y.
7/32	$0.05½	$0.05½	1	0.25	$.25
¼	.06	.06	1¼	.33	.33
⅜	.09	.09	1½	.40	40
½	.12	.12	1¾	.47	.47
⅝	.15	.15	2	.55	.55
¾	.18	.18	2¼	.65	.65

	7/32 In.		¼ In.	
Per 1000 Ft. Net	Chicago	N. Y.	Chicago	N. Y.
Less than $15.00 list	$36.67	$55.00	$40.00	$60.00
$15.00 to $60.00 list	27.50	24.50	30.00	27.00
$60.00 to $150.00 list	24.75	21.50	27.00	23.50

METALLIC FLEXIBLE CONDUIT

		List per 100 Ft.	
Size, In.	Feet per Coil	Chicago	New York
5/16	250	$5.00	$5.00
⅜	250	7.50	7.50
½	100	10.00	10.00
¾	50	13.00	13.00
1	50	21.00	21.00
1¼	50	26.00	26.00
1½	25-50	35.00	35.00
2	25-50	45.00	45.00
2½	25-50	52.00	52.00

	⅝" Single Strip		⅜" Double Strip	
	Chicago	N. Y.	Chicago	N. Y.
Less than coil per 1000 ft., net	$71.25	$75.00	$75.00	$106.00
Cost to 1000 ft. per 1000 ft. net	60.00	61.50	67.50	90.00

	½" Single Strip		½" Double Strip	
	Chicago	N. Y.	Chicago	N. Y.
Less than coil per 1000 ft., net	$95.00	$105.00	$100 00	.....
Cost to 1000 ft. per 1000 ft., net.	80.00	82.00	90.00	.....

FLEXIBLE-STEEL ARMORED CONDUCTORS

Single Conductor

	List	
B. & S. Size	Chicago Per 1000 Ft.	N. Y. Per 1000 Ft.
No. 14 solid	$61.00	$61.00
No. 12 solid	71.00	71.00
No. 10 solid	90.00	90.00
No. 8 solid	106.00	106.00
No. 6 solid	145.00	145.00

	List	
B. & S. Size	Chicago Per 1000 Ft.	N. Y. Per 1000 Ft.
No. 10 stranded	$95.00	$95.00
No. 8 stranded	115.00	115.00
No. 6 stranded	160.00	160.00
No. 4 stranded	205.00	205.00
No. 2 stranded	266.00	266.00
No. 1 stranded	315.00	315.00

Twin Conductor

	List	
B. & S. Size	Chicago Per 1000 Ft.	N. Y. Per 1000 Ft.
No. 14 solid	$104.00	$104.00
No. 12 solid	135.00	135.00
No. 10 solid	185.00	185.00

	List	
B. & S. Size	Chicago Per 1000 Ft.	N. Y. Per 1000 Ft.
No. 8 stranded	$235.00	$235.00
No. 6 stranded	370.00	370.00
No. 4 stranded	575.00	575.00

DISCOUNT PER 1000 FT.

Single Conductor

	Chicago	N. Y.
No. 14 solid:		
Less than coil	+10%	Net
Coil to 1000 ft	—10%	3%
No. 12 solid:		
Less than coil	+10%	Net
Coil to 1000 ft	—10%	3%

Twin Conductor

	Chicago	N. Y.
No. 14 solid:		
Less than coil	+10%	Net
Coil to 1000 ft	—10%	3%
No. 12 solid:		
Less than coil	+10%	Net
Coil to 1000 ft	—10%	3%

KNIFE SWITCHES

250-Volt, Front Connections, No Fuse

	List	
	Chicago	N. Y.
Perkins or Trumbull Type A:		
30-amp. S. P. S. T	$0.80	$0.80
60-amp. S. P. S. T	1.20	1.20
100-amp. S. P. S. T	2.25	2.25
200-amp. S. P. S. T	3.48	3.48
300-amp. S. P. S. T	5.34	5.34
30-amp. D. P. S. T	1.20	1.20

KNIFE SWITCHES (Continued)

	List	
Perkins or Trumbull, Type A (Continued):	Chicago	N. Y.
60-amp. D. P. S. T.	$1.78	$1.78
100-amp. D. P. S. T.	3.38	3.38
200-amp. D. P. S. T.	5.20	5.20
300-amp. D. P. S. T.	8.00	8.00
30-amp. 3 P. S. T.	1.80	1.80
60-amp. 3 P. S. T.	2.68	2.68
100-amp. 3 P. S. T.	5.08	5.08
200-amp. 3 P. S. T.	7.80	7.80
300-amp. 3 P. S. T.	12.00	12.00
Perkins Type B or Trumbull Type C:		
30-amp. S. P. S. T.	0.42	0.42
60-amp. S. P. S. T.	0.74	0.74
100-amp. S. P. S. T.	1.50	1.50
200-amp. S. P. S. T.	2.70	2.70
30-amp. D. P. S. T.	0.68	0.68
60-amp. D. P. S. T.	1.22	1.22
100-amp. D. P. S. T.	2.50	2.50
200-amp. D. P. S. T.	4.50	4.50
30-amp. 3 P. S. T.	1.02	1.02
60-amp. 3 P. S. T.	1.84	1.84
100-amp. 3 P. S. T.	3.76	3.76
200-amp. 3 P. S. T.	6.76	6.76

DISCOUNT

Type A, Perkins or Trumbull:	Chicago	N. Y.
Less than $10 list	Net	Net
$10 to $25 list	15%	15%
$25 to $50 list	18%	18%
Type B, Perkins, or Type C, Trumbull:		
Less than $10 list	10%	10%
$10 to $25 list	20%	20%
$25 to $50 list	28%	28%

OUTLET BOXES

Union Cat. No.	Black List per 100 Chicago	Black List per 100 N. Y.
101	$30.00	$30.00
102	30.00	30.00
103	25.00	25.00
106	20.00	20.00

Union Cat. No.	Galv. List per 100 Chicago	Galv. List per 100 N. Y.
101	$30.00	$30.00
102	30.00	30.00
103	25.00	25.00
106	20.00	20.00

	Black		Galvanized	
Discount	Chicago	N. Y.	Chicago	N. Y.
Less than $10.00 list	40%	Net	35%	Net
$10.00 to $50.00 list	50%	25%	45%	20%

SECTIONAL CONDUIT SWITCH BOXES

C. F. Mfg. Co.	List, Each Chicago	List, Each N. Y.
No. 155	$0.34	$0.34
No. 160	0.60	0.60

	Black		Galvanized	
Discount	Chicago	N. Y.	Chicago	N. Y.
Less than $2.00 list	40%	40%	30%	30%
$2.00 to $10.00 list	50%	50%	40%	40%
$10.00 to $50.00 list	64%	60%	52%	52%

MAZDA LAMPS

105 to 125 Volts

	Std. Pkg.	List Chicago	List N. Y.
Regular, clear:			
10 to 40-watt—B	100	$0.27	$0.27
60-watt—B	100	.36	.36
100-watt—B	24	.65	.65
75-watt—C	50	.65	.65
100-watt—C	24	1.00	1.00
200-watt—C	24	2.00	2.00
300-watt—C	24	3.00	3.00
Round bulbs, 3½ in., frosted:			
15-watt—G 25	50	.50	.50
25-watt—G 25	50	.50	.50
40-watt—G 25	50	.50	.50
Round bulbs, 3¾ in., frosted:			
60-watt—G 30	24	.72	.72
Round bulbs, 4¾ in., frosted:			
100-watt—G 35	24	1.05	1.05

	Discount	
	Chicago	N. Y.
Less than standard package	Net	Net
Standard package	10%	10%

PORCELAIN KNOBS

	5½ N.C.—Solid Std. Pkg. 3500		Nail-it—N.C. Std. Pkg. 4000	
Per 1000 Net	Chi.	N. Y.	Chi.	N. Y.
Less than 1/5 std. pkg.	$9.75	$11.25	$20.75	$18.00
1/5 to std. pkg.	9.00	9.00	16.30	15.00

PORCELAIN CLEATS—UNGLAZED

2 and 3 Wire

	Per 1000 Net	
	Chicago	N. Y.
Less than 1/5 std. pkg.	$14.00	$15.00
1/5 to std. pkg.	13.00	12.00

Standard package, 2200. List per 1000, $20.

DRY BATTERIES

	No. 6 Regular,		No. 6 Ignitor,	
Each Net	Chicago	N. Y.	Chicago	N. Y.
Less than 12	$0.35	$0.35	$0.35	$0.35
12 to 50	.30	.30	.30	.30
50 to barrel	.26¼	.26	.27½	.27
Barrel lots	.24¾	.24½	.25¾	.25½

ELECTRIC TOASTERS, UPRIGHT

	Chicago	N. Y.
List	$4.50	$5.50
Discount	25%	Net

ELECTRIC IRONS

	Chicago	N. Y.
List	$5.50	$5.50
Discount	30%	Net

WIRE LAMP GUARDS

Per 100 Net	Chicago	N. Y.
Less than 50, Matthews 16-cp	$20.00	$20.00
Less than 1/5 std. pkg. Hubbell	28.35	23.80
Less than 36, 60-watt Loxon	25.00	26.25

ATTACHMENT PLUGS

	Std. Pkg.	List Chicago	List N. Y.
Benjamin No. 903	100	$0.25	$0.25
Hubbell No. 5406	250	.30	.30
Bryant No. 706	100	.25	.25
G. E. 50996	250	.22	.22

Discount	Chicago	N. Y.
Less than 1/5 std. pkg.:		
Benjamin No. 903	12%	12%
Hubbell No. 5406	+10%	Net
Bryant No. 706	+20%	10%
G. E. 50996	+20%	20%
1/5 to std. pkg.:		
Benjamin No. 903	20%	20%
Hubbell No. 5406	10%	15%
Bryant No. 706	Net	20%
G. E. 50996	Net	44%
Std. pkg.:		
Benjamin No. 903	44%	52%
Hubbell No. 5406	34%	28%
Bryant No. 706	30%	34%
G. E. 50996	30%	52%

SNAP AND FLUSH SWITCHES

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List Chicago	List N. Y.
5-amp. single-pole	250	$0.28	$0.28
5-amp. single-pole, ind.	250	.32	.32
10-amp. single-pole	100	.48	.48
10-amp. single-pole, ind.	100	.54	.54
5-amp., three-point	100	.56	.56
10-amp., three-point	50	.76	.76
10-amp., 250-volt, D. P.	100	.66	.66

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List Chicago	List N. Y.
10-amp. single-pole	100	$0.45	$0.45
10-amp. three-way	50	.70	.70
10-amp. double-pole	50	.70	.70

Discount	Chicago	N. Y.
Less than 1/5 standard package	Net	Net
1/5 to standard package	15%	15%
Standard package	20%	28%

INCLOSED FUSES

250-Volt	Std. Pkg.	List Chicago	List N. Y.
3-amp. to 30-amp.	100	$0.25	$0.25
35-amp. to 60-amp.	100	.35	.35
65-amp. to 100-amp.	50	.90	.90
110-amp. to 200-amp.	25	2.00	2.00
225-amp. to 400-amp.	25	3.60	3.60
450-amp. to 600-amp.	10	5.50	5.50
600-Volt			
3-amp. to 30-amp.	100	$0.40	$0.40
35-amp. to 60-amp.	100	.60	.60
65-amp. to 100-amp.	50	1.50	1.50
110-amp. to 200-amp.	25	2.50	2.50
225-amp. to 400-amp.	25	5.50	5.50
450-amp. to 600-amp.	10	8.00	8.00

Discount	Chicago	N. Y.
Less than ½ standard package	28%	28%
1/5 to standard package	38%	38%

FUSE PLUGS

3-Amp. to 30-Amp.

Per 100 Net	Chicago	N. Y.
Less than 1/5 standard package	$6.25	$5.00
1/5 to standard package	5.25	4.50

Standard package, 500. List, $0.07.

SOCKETS AND RECEPTACLES

	Std. Pkg.	List Chicago	List N. Y.
¼-in. cap key socket	500	$0.33	$0.33
¼-in. cap keyless socket	500	.30	.30
⅛-in. cap pull socket	250	.60	.60

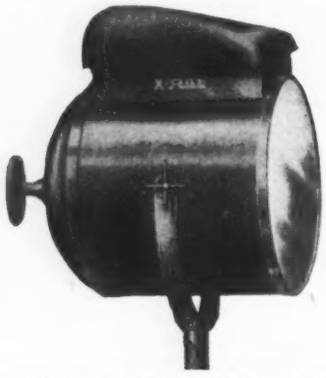
Discount	Chicago	N. Y.
Less than 1/5 standard package	Net	Net
1/5 to standard package	15%	20%

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Lamp for Floodlighting

Standard lamps of any rating having a mogul base can be used in the projector shown herewith, manufactured by the X-Ray Reflector Company of Chicago and New York. This unit has



PROJECTOR THAT USES STANDARD MOGUL-BASE LAMPS

a range of 300 to 1500 watts. When mounted on its base this projector is easily adjusted for position in both the horizontal and vertical planes and securely clamped. Attention is called to the hinged top hood. When opened, the focusing mechanism is readily accessible, lamps may be replaced and the reflector and front glass easily cleaned. A reflector of special parabolic design is used. The device is made of heavy steel and castings, finished in black and is weatherproof, well ventilated and light in weight.

Entrance Fitting

Entrance fittings that are reversible and may be used either for vertical or horizontal installations have been de-

REVERSIBLE ENTRANCE FITTING

veloped by the E. H. Freeman Electric Company of Trenton, N. J. Removing the porcelain cap leaves a straight pull for the wires, which can be easily fed through the well-glazed outlet holes of the cap. These holes are provided with drip sheds for carrying off the moisture. The porcelain cap is fastened to the flange of the hub by two heavy brass screws, which are locked in the cap to prevent loss as well as to cut down the time of installing. These fittings are made in ½, ¾ and 1-in. (1.27, 1.9 and 2.54-cm.) sizes and can be furnished either in black enamel or galvanized finish.

Vibrating-Reed Slip Indicator

Vibrating-reed slip indicators that consist essentially of a gear box, a rotating slotted disk, an electromagnetic vibrator with a steel reed and a lamp for illumination purposes have been developed and are being used by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa. The gear box consists of three sets of

SLIP INDICATOR OF VIBRATING-REED TYPE

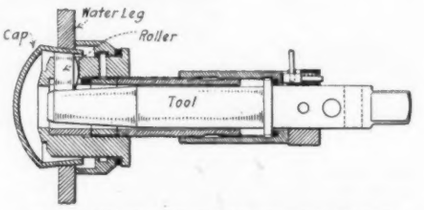
pinions by means of which the disk may be driven at various speeds with respect to the speed of the motor under test. So that the indicator may be attached to and detached from the driving shaft of the motor while running, a short flexible shaft and separable coupling with a sleeve is provided. Five disks are furnished with each indicator, each having a different number of slots. For a two-pole and four-pole machine a two-slot disk should be used, for six, twelve and eighteen-pole machines a six-slot disk and so on.

When the motor under test is operating on a 110-volt circuit the electromagnet of the vibrator is excited from the same circuit. When, however, the motor is operating on higher voltages the magnet is excited from the 100-volt secondary of a potential transformer whose primary leads are connected across one phase of the same circuit on which the motor under test is operating.

In operation the reed is observed through the slots in the rotating disk. If the motor is operating at a speed slightly different from synchronous, the reed will be seen in a different position at each revolution of the disk, apparently oscillating from side to side similarly to a pendulum. A complete oscillation corresponds to one alternations slip. When the disk is direct-connected to the motor the number of these apparent oscillations per minute divided by the frequency of the circuit is equal to the per cent slip. When the disk is driven through the gears the per cent slip is equal to the marking on the pinion (0, 4 or 8) to which the motor is connected, plus or minus the per cent slip as determined above. Whether the sign is plus or minus may be ascertained readily by noting the change in the rate of oscillations with change in load. The gear box is used since it is difficult to count oscillations occurring faster than 150 per minute.

Cap for Boilers

The Key Boiler Equipment Company, Pierce Building, St. Louis, Mo., has brought out a metal hand-hole cap which eliminates the necessity for gaskets in water-tube boilers and produces a metal-to-metal joint which, it is claimed, is more satisfactory than a joint made by the use of a gasket. In applying the caps all of the hand holes are converted to a standard size by revolving special rollers furnished with the caps. As the rollers revolve they remove any roughness from the interior diameter of the hole and impart to it a slight but effective taper. The hand-hole caps are also tapered slightly. After being coated with a graphite and linseed-oil paste they are driven by means of a lead mallet into the holes from inside the



HAND-HOLE CAP WITH SLIGHT TAPER

water leg. Then the rollers of the setting tool are revolved inside the open cup face of the cap, thereby pulling the cap tightly into the hole and

making a metal-to-metal contact which will stand more than 1500 lb. per square inch (105.5 kg. per sq. cm.) on hydrostatic tests. This tightening of the cap is not an expanding operation but is one of rounding out the cap to fit the tapered hole. Steam pressure on the cap in this position of course helps hold it like a check valve. When it is necessary to remove the caps they can be unseated by a hammer blow on the protruding edge. The same caps can be reused several times before they have finally to be discarded.

Electric Hair Curler

A small light-weight curling iron which is convenient to use has been brought out by the Russell Electric Company of Chicago. The device is made of steel and has a black walnut

LIGHT-WEIGHT CURLING IRON

handle. A 20-watt heating element is used. Instead of being mounted on a mica or lava core it is wound on an asbestos one. This construction makes a more durable heater, it is said, since the treatment which the curler receives will not be so likely to break the element as it would if the resistance wire were wound around on a rigid core.

Floodlighting Projectors

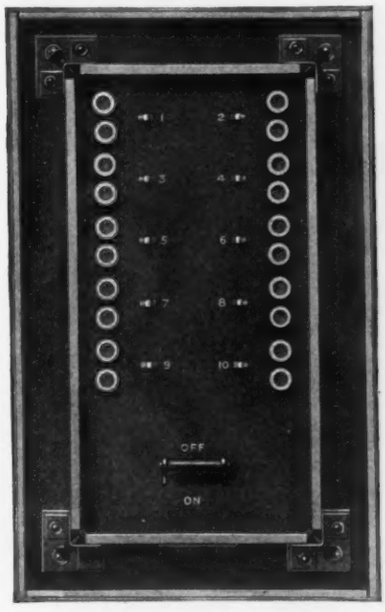
Incandescent floodlighting projectors mounted on cast-iron swivel bases which permit the projector to be turned in any direction are being made by the Crouse-Hinds Company of Syracuse, N. Y. They are equipped with a quadrant which provides means for elevating or depressing the beam. The casing of the projector, which is made of black-japanned, alloy-coated iron (rust-resisting), is thoroughly weatherproof and is ventilated to dissipate the

PROJECTOR MOUNTED ON SWIVEL BASE

heat given off by the lamp. The reflectors used in the projectors are true paraboloids, consisting of metal which has been spun over accurate steel forms. The glass reflectors are ground, buffed and polished on both surfaces. Focus-type lamps are mounted horizontally in the reflectors. On the back of each projector case is a knurled wheel, which furnishes means for moving the lamp forward or backward as desired. Because of the concentrated lamp filament used, a narrow beam of light having only about 10 deg. divergence can be obtained, it is claimed.

Safety Lighting Panels

Safety lighting panels furnished in steel cabinets have been placed on the market by the Sprague Electric Works of the General Electric Company, New York City. When the door is open the receptacles for the plug fuses and the operating handles of branch-circuit switches are exposed. The latter are of the 30-amp., 250-volt quick-make-and-break tumbler type. The "on" or "off"



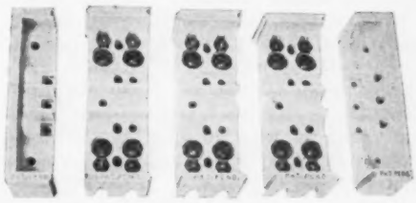
LIGHTING PANEL OF SAFETY TYPE EQUIPPED WITH MAIN SWITCH

positions of the switch are indicated by the position of the switch handle. Current-carrying parts are protected under a neatly finished cover, through which the switch handles and fuse receptacles protrude.

This type of panel is also furnished with a brush-contact, double-break, quick-break main switch when desired, the handle of which also protrudes through the cover. When in the open position this switch is entirely disconnected from live parts of the panel. The brushes are furnished with secondary contact tips to break the arc, thus reducing the possibility of burning the main brushes. The switch is held in the closed position by a toggle mechanism. All parts of the panelboard, including both branch-circuit and main switch, are removable from the front of the board. The construction employed permits the use of a minimum number of electrical joints. This panel can also be furnished with National Electrical Code inclosed fuses in the branches or with main fuses or sub-feeder switches with fuses.

Barrier Cut-Out

Cut-outs designed for cabinet work where a wiring gutter is desired have been developed by the C. & P. Electric Works of Springfield, Mass. They are made of white glazed porcelain with an upturned end which forms a barrier around the wiring gutter. Each cut-

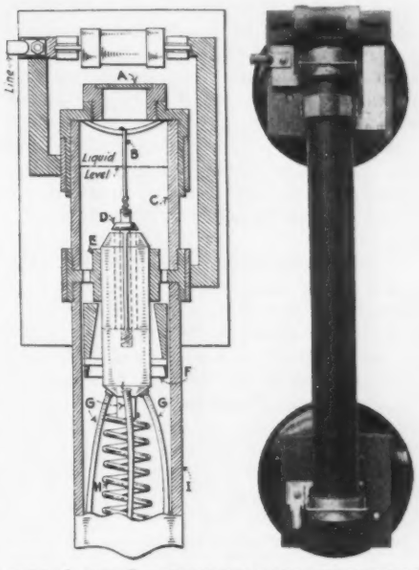


METHOD OF FITTING CUT-OUTS TOGETHER TO FORM PANEL

out is furnished with a busbar, which may be joined to the sections of the adjoining cut-outs. The end pieces are furnished in pairs with sectional busbar lug ends for one end. The cut-outs are made to fit into a box 3 in. (7.6 cm.) deep.

High-Tension Circuit-Breaking Device

An automatic high-potential circuit-breaking device that has been developed by Schweitzer & Conrad, Inc., of Chicago, is shown in the accompanying illustrations. According to the manufacturers it is particularly well adapted to service where automatic reclosing is not necessary and at substation feeder ends, in industrial stations, and where



FIGS. 1 AND 2—HIGH-VOLTAGE SWITCHING DEVICE AND CROSS-SECTION OF UPPER PART

A—vent. B—fusible retaining link. C—insulating tube. D—replaceable arcing tip. E—main circuit-breaking contact. F—liquid director. G—flexible cable. H—spring. I—insulating tube.

outdoor air-break switches are now being used. While the unit is limited in application by the fact that it must be reset by hand owing to the use of spring-opened contacts and a fuse normally holding the spring extended, the

device has numerous advantages. For example, it is relatively inexpensive, occupies very little space, presents practically no fire hazard (because the contacts are immersed in carbon tetrachloride), can be renewed at small expense, permits the line to be opened under load, can be used in conjunction with relays, and is said to rupture an arc inside one cycle.

In general, the device consists of cartridge-inclosed, carbon-tetrachloride-immersed, spring-opened contacts normally held closed by a fusible link. Shunted across the latter so that it will not heat perceptibly and thus deteriorate under normal conditions is an auxiliary fuse such as is used on low-voltage circuits. When the low-voltage fuse opens because of overload the fusible link is compelled to carry the entire current. Having low-current carrying capacity it is ruptured immediately, thereby releasing the spring, which in turn opens the circuit by immediately separating the contact. While the gap thus interposed is usually sufficient to extinguish the arc, a funnel-shaped liquid deflector is attached to the movable contact so that it will cause carbon tetrachloride to be projected against the arc.

The spring employed to separate the contacts is shunted by flexible conductors and therefore does not deteriorate from carrying current. The inclosing tube is made of non-fragile Bakelized material. The fusible link is non-corrosive and has high resistance and high tensile strength.

If desired, a low-voltage circuit breaker may be shunted across the fusible link instead of using a low-voltage fuse, thus making it possible to open the circuit by hand and eliminating the necessity of the auxiliary fuse. By connecting the line directly to the stationary contact instead of to the cap of the tube and using relays to close a battery circuit through the fusible link the device can be controlled from a distance and several circuit breakers of this type can be made to operate simultaneously.

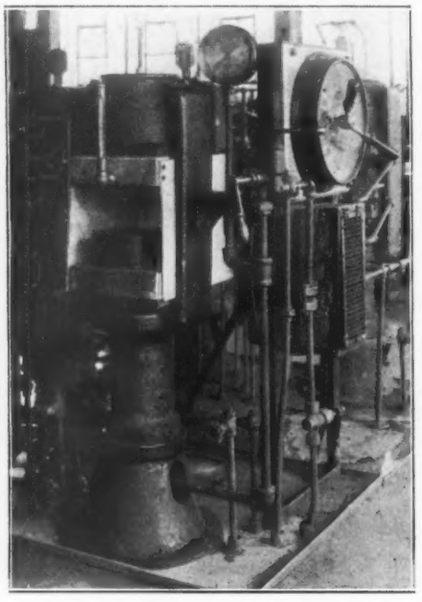
Three successive short-circuit tests were made recently on a 100,000-volt circuit breaker of this type in which a current of about 1500 amp. at 12,000 volts was ruptured each time without any damage to the device. Energy for the tests was furnished by two 3000-kw. transformers in series, the combined impedance of the circuit being approximately 10 per cent. A 110-amp. fuse was employed.

Electrically Heated Molding Presses

The Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., has adopted electric heating for twenty-three presses used in the manufacture of molded-composition material. These presses were formerly heated by steam, but a trial of an electrically heated press proved so satisfactory that the entire set of presses in the company's molded insulation department is now being modified for equipping with electric heaters.

The heat is furnished by means of two plates 1 ft. by 1 ft. by 3½ in. (0.3 m. by 0.3 m. by 8.9 cm.) thick, covered on their exposed surfaces with magnesia to reduce the radiation losses. The upper plate is stationary and is in contact with a thermometer. The lower plate is movable vertically. Each plate is made up of two halves, in each of which are two grooves holding the heating units. Thus there are four heating units to each plate, or eight per press. Each unit is 12 in. long by 2¼ in. wide by 3/16 in. thick (30.5 cm. by 5.75 cm. by 4.8 mm.) and is rated at 300 watts. The heating units are of the Westinghouse steel-clad bayonet type, consisting of a flat ribbon resistor assembled in a mica sheath and inclosed in a heavy steel casing. This construction reduces to a minimum the possibility of injury and also provides rapid transfer of heat from the resistance element, thus insuring long life under severe conditions of service.

The presses are arranged in sets of



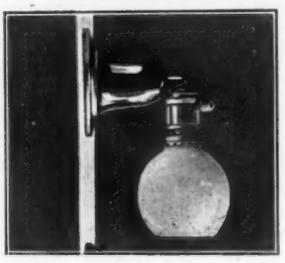
ELECTRICALLY HEATED PRESS AND CONTROL

four. Current is supplied to each set through a multi-tap transformer and a dial face plate. The dial has fifteen contacts and furnishes fifteen voltages, varying from a maximum of 220 volts, the line voltage, to a minimum of 150 volts, with relative inputs for each set of heaters of from 2400 watts maximum to 1200 watts minimum. This arrangement provides for an input of high value for quick heating when the press is cold and it is desired to heat it rapidly; one of low value when the press is not to be used but it is desired to keep it hot for later use, and several intermediate inputs when it is desired to keep the press hot while in steady use on work having different heat requirements.

A series of tests made on one of the presses show that from one to one and one-fourth hours are required to heat the plates, starting cold, and that 1800 watts is required to keep the press hot while in steady use for work requiring a temperature of 190 deg. C.

Improved Wall Bracket

Wall brackets which Spring & Buckley of New Britain, Conn., claim always remain firm are shown herewith. These brackets consist of two parts, an angle socket and a canopy with



WALL BRACKET OF TWO PARTS

screw holes near the outer edge with a ⅜-in. (9.5 mm.) nipple soldered firmly in the end. These brackets are easily installed, No. 14 B. & S. gage wire being run direct to the binding screws in the socket. This construction avoids the use of fixture wire and splices, it is claimed. The Plume & Atwood Manufacturing Company of Waterbury, Conn., makes up the parts.

Garage-Door Opener

The Richards-Wilcox Manufacturing Company of Aurora, Ill., has developed a motor-driven door opening and closing apparatus. The equipment consists of a specially built motor mounted on a base with reduction gears, drums and a control relay, in addition to two limit switches, three sets of push-buttons and the necessary cable and chain. The apparatus can be adapted to practically any style of door and has been designed so that it cannot be harmed by the operation of switches in the wrong sequence.

Lamp Guards

The Flexible Steel Lacing Company of Chicago, Ill., is marketing guards for incandescent lamps. The guards are made from expanded flexible steel coat-

FLEXIBLE STEEL LAMP GUARD OPEN

ed with tin, and are shaped so that they fit closely around the lamps they protect and cannot be taken off without a special key. The accompanying illustration shows the guard open for removing or inserting the lamp.

Trade Notes

THE GROSSMAN ELECTRIC COMPANY has moved from Philadelphia to 142 South Seventh Street, Allentown, Pa.

THE McINTOSH & SEYMOUR CORPORATION has established its New York office in the Singer Building, 149 Broadway.

THE NATIONAL CONDUIT & CABLE COMPANY has changed the location of its Chicago office from 72 West Adams Street to the Rookery.

THE ROBBINS & MYERS COMPANY has changed the location of its Chicago office from 320 Monadnock Building to 1444-6-8 Conway Building.

THE JENT ELECTRIC COMPANY, manufacturer of tungsten lamps, has leased property at 369-371 Ogden Street, Newark, N. J., for a new manufacturing plant.

THE ATLANTIC INSULATED WIRE & CABLE COMPANY announces the removal of its general sales office from 120 Liberty Street to the Vanderbilt Concourse, 52 Vanderbilt Avenue, New York City.

THE ELECTRIC DYNAMIC COMPANY, Avenue A, Bayonne, N. J., manufacturer of dynamos and motors, has filed plans for the erection of an addition on North Street and Avenue A, to cost about $15,000.

THE SERVICE SUPPLY & EQUIPMENT COMPANY of Pittsburgh, Pa., will move its sales office about May 1 from the Fulton Building to the Bessemer Building, where it will have larger and better quarters.

VERNE W. SHEAR & COMPANY, Akron, Ohio, sales engineers, have established a branch office in the Illuminating Building, Cleveland, Ohio, in charge of Bon J. Ballard, formerly with the H. W. Johns-Manville Company.

CHARLES M. CROFOOT has been transferred from the post of district sales manager of the Cincinnati office to the New York City office of the Crouse-Hinds Company and not of the Federal Sign System (Electric) as stated in the ELECTRICAL WORLD for April 28.

H. B. KANTER announces that the copartnership existing between W. F. Austin and H. B. Kanter, under the style of Austin & Kanter, has been dissolved by mutual agreement. Mr. Kanter has formed the H. B. K. Electric Company, 92 Jackson Avenue, Long Island City, N. Y.

THE CUMBERLAND ELECTRIC MANUFACTURING COMPANY, manufacturer of low-voltage transformers and electrical specialties, has moved its office and factory to Memphis, Tenn., because of increased business and to have better shipping and working conditions. This company was formerly established at Clarksville, Tenn.

H. A. HOWARD, for many years connected with the C. & C. Electric Company, and until recently associated with the Diehl Manufacturing Company, has been appointed manager of the New England office of the C. & C. Electric & Manufacturing Company. Mr. Howard has had a wide experience in the electrical line, this experience extending over a quarter of a century.

THE AUGUST MIETZ CORPORATION announces that the business of August Mietz (Emma C. Rueff, proprietress) has been sold and transferred to the August Mietz Corporation. The officers of the new corporation are: Emma C. Rueff, president; Emil Rueff, vice-president and treasurer; Otto Von Schrenk, secretary, and Louis C. Eitzen, general manager. The business will be continued under the corporate form of organization, at the same address, and without any change in its policy, under the personal management of Louis C. Eitzen.

AUTOMOTIVE ELECTRIC ACCESSORIES MANUFACTURERS ORGANIZE.—An organization of manufacturers of automotive electric accessories was formed at Atlantic City, N. J., on April 16. This new organization will be known as the Automotive Electric Association. Among its members are the largest and best known manufacturers in this line. The purposes of the organization are to improve and develop this branch of automotive electric accessories business through standardization and by friendly interchange of experience with reference to design and manufacture. The following officers were elected at this meeting: President, G. Brewer Griffin, Pittsburgh, Pa.; vice-president, C. O. Mininger, Toledo, Ohio; secretary, G. S. Cole, Cleveland, Ohio; treasurer, C. L. Amos, Syracuse, N. Y. The next meeting of this association will be held at Hot Springs, Va., May 17, 18 and 19.

THE AMERICAN-RUSSIAN CHAMBER OF COMMERCE of New York announces that the 1918 edition of "Industrial America," a handbook of industrial, commercial and financial information, together with a classified trade directory of American firms for use in Russia, is now in course of preparation. American manufacturers who are interested in the Russian field are invited to forward to the American-Russian Chamber of Commerce information regarding their firms and their products for listing in the trade directory section of the handbook. There is no charge for such listing, the purpose of the directory being to place before Russian purchasers the most complete and comprehensive list possible of responsible American firms that can supply the wants of Russian consumers. Proper forms for supplying information for the trade directory may be had by applying to the American-Russian Chamber of Commerce, Woolworth Building New York.

New Incorporations

THE LIGHTING FIXTURE STUDIO of Chicago, Ill., has been incorporated by Daniel C. Jones, Frederick Arnd and M. E. Troyer. The company is capitalized at $25,000.

THE ELECTRIC REPAIR COMPANY of Chicago, Ill., has been incorporated with a capital stock of $2,500 by Edward Sherburne, John T. Hartley and H. P. Williams.

THE ELECTRIC SUPPLY COMPANY of Ogden, Utah, has been incorporated with a capital stock of $5,000, to deal in electrical supplies. The officers are: R. C. Carter, president; C. J. Elder, vice-president, and F. E. Young, secretary and treasurer.

THE FRANKLIN POWER COMPANY of Farmington, Me., has been incorporated with a capital stock of $300,000 to develop water powers and supply electricity in Farmington and surrounding towns. F. J. Savage of Fairfield, Me., is president of the company.

L. J. LEWERY & COMPANY of New York, N. Y., have been incorporated with a capital stock of $25,000 to do a general mechanical, electrical and industrial engineering business. The incorporators are: Leonard J. Lewery, Charles W. Sutton and Walter H. Carman.

THE ELECTRIC COAL MINING & MACHINERY COMPANY of Chicago, Ill., has been incorporated with a capital stock of $150,000 to manufacture coal-mining machinery. The incorporators are: Arthur A. Bettridge Ralph E. Battan and Seward N. Mighell of Chicago, Ill.

THE PLAYER SPECIALTIES COMPANY, 418 East Water Street, Milwaukee, Wis., has been organized to manufacture automatic playing devices for pianos and organs, to be operated by electricity. The incorporators are: James C. Arthur, John C. Stenger and Frank J. Clark.

THE LANTON ADAMS ELECTRIC COMPANY of New York, N. Y., has been chartered with a capital stock of $10,000 to manufacture and deal in electrical machinery. The incorporators are: E. Schuster, S. Hess and R. A. Lan, 315 West Ninety-fourth Street, New York, N. Y.

THE MORRIS PROCESS OF NEW JERSEY of Jersey City, N. J., has been incorporated by C. H. Jarvis, P. L. Neiser and J. L. Turner of Jersey City. The company is capitalized at $150,000 and proposes to manufacture and deal in engines, motors, compressors, power-distributing machinery, etc.

THE WELCH ARMATURE COMPANY of Welch, W. Va., has been incorporated by John M. Lewis, Joseph A. Lewis of Elkhorn, W. Va.; Carl H. Ehret, T. Miller Freeman and D. J. F. Strother of Welch, W. Va. The company is capitalized at $5,000 and proposes to deal in electrical supplies.

THE SIMS MAGNETO COMPANY of East Orange, N. J., has been incorporated by R. C. Anderson, E. O'Meara of New York, N. Y., and A. A. Fisher of East Orange, N. J. The company is capitalized at $1,250,000 and proposes to manufacture and deal in electrical and mechanical apparatus, boats and aircraft.

THE MANCHA STORAGE BATTERY LOCOMOTIVE COMPANY of Wilmington, Del., has been incorporated with a capital stock of $300,000 to manufacture, use, lease and install locomotive and electric devices of all kinds. The incorporators are: Herbert E. Latter, C. L. Rimlinger, Clement M. Egner of Wilmington, Del.

THE WATERLITE POWER & ENGINEERING COMPANY of New York, N. Y., has been chartered with a capital stock of $8,500 by A. W. Cubby, H. L. Shartle and G. R. Bennett, 183 Madison Street, Brooklyn, N. Y. The company proposes to manufacture and deal in compressors, water supplies, electric-lighting appliances, motors, pumps, etc.

THE GENERAL GAS-ELECTRIC COMPANY of Hanover, Pa., has been chartered with a capital stock of $104,000 to manufacture and deal in engines. The company manufactures the Genco light and power equipment for farms and rural dwellings. The incorporators are: V. K. Jordan, John J. Schmidt and W. F. Kintzing, all of Hanover.

THE ELECTROLYTIC ENGINEERING CORPORATION of New York, N. Y., has been incorporated by M. Kirschberg, P. R. Gordon and A. Heyert, 170 Broadway, New York, N. Y. The company is capitalized at $50,000 and proposes to deal in electrolytic processes, apparatus and machinery for distributing electricity for light, heat and power purposes.

THE NEW JERSEY PRODUCTS COMPANY of West Orange, N. J., has been incorporated with a capital stock of $500,000 by Thomas A. Edison, Charles Edison, R. H. Allen of West Orange, N. J.; Stephen B. Mambert of East Orange, and A. C. Emery of Montclair. The company proposes to manufacture chemicals, glues, veneers, stains and shellac, paper products, phonographs, sound records, storage batteries, etc.

Trade Publications

AMPLIFIER.—The Standard Radio Apparatus Company of Ocean Park, Cal., has prepared a leaflet descriptive of its amplifiers.

PAINT.—The National Lead Company of New York is distributing a booklet entitled "Red Lead and How to Use It," by Prof. A. H. Sabin.

IRONS.—The "American Beauty" electric iron is described and illustrated in a leaflet issued by the American Electric Heater Company of Detroit, Mich.

LAMPS.—Plumwood adjustable electric portable lamps are illustrated and described in a bulletin distributed by the Plume & Atwood Manufacturing Company, Waterbury, Conn.

SPEED INDICATORS.—The Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., has prepared leaflet 3977, descriptive of its electrical speed indicators for use in power stations, industrial plants and similar applications.

METERING EQUIPMENTS.—Outdoor metering equipments are illustrated and described in leaflet 3976, recently prepared by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa. These equipments are adapted for use on transmission lines where the expense of a substation is not warranted.

FAULT LOCALIZERS.—Leaflet 3890, descriptive of portable fault localizers, is being distributed by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa. This instrument is designed for locating grounds in feeder circuits, being an application of the Wheatstone bridge mounted in a portable case.

OVERHEAD RELAYS.—The Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., has prepared leaflet No. 3978, descriptive of its type HB overhead relays. These relays are designed for use on high-voltage circuits, and are for indoor use, offering ample protection and sufficiently accurate time element for ordinary service.

BATTERIES.—The Electric Storage Battery Company of Philadelphia has issued catalog KXS, describing its latest type of portable battery for railway signal service. This battery has been especially designed to give sixty-day service on one charge with very little increase in weight as compared with types heretofore used for thirty-day service. Particular attention has been given to details of design making for durability and long life. The plates, separators, jars, covers and carrying cases are of especially rugged construction. The E. S. B. double-flange cover and automatic filling and vent plug are important features, eliminating the escape of acid spray during charge and preventing slopping of acid over the tops of the cells while filling.

New England States

HIRAM, ME.—Plans are being prepared for the construction of two extra penstocks at the large dam of the Cumberland County Power & Light Company at the Great Falls of the Saco. The proposed improvement will enable the company to double the output of its plant.

PORTLAND, ME. — The Cumberland County Power & Light Company has applied to the Public Service Commission for permission to issue $440,000 in bonds, of which the proceeds of $207,727 are to be expended for improvements to its property during the period ending Dec. 31, 1917, as follows: Hiram hydroelectric development and transmission lines, $45,000; extension of lines and services for the year ending Dec. 31, 1917, $35,000; high-voltage tie line between Sewall Street station and Plum Street station, $35,000; extension of transmission lines from Cumberland to Yarmouth, $20,000; 16-way duct line between Sewall Street station and Deering Avenue, $32,396; grounding service to existing customers, $6,000, and additional voltage regulators to control two additional circuits, $7,000.

BRISTOL, VT.—The Hortonia Power Company of Rutland has acquired property in the town of Bristol, above its present dam, which provides for 250 hp. The company proposes to extend the penstock at the Bristol plant at the stream about 1000 ft., increasing the head from 115 to 250 ft. As soon as material can be secured it is planned to install a new waterwheel and generator in the present power house, increasing the output to 1000 hp. The company will also extend its electric transmission lines to Monkton, Monkton Ridge and Hinesburg, supplying electricity to farms between Brandon and Hinesburg in addition to the villages named. It is also proposed to connect the generating station by transmission line with the generating stations of the company located at Bethel, Gaysville, Hortonville, Salisbury, Danville, Barnet, Groton, Ryegate, Brandon and Port Benson and with the plant at Port Henry, N. Y.

NEWFANE, VT.—The Twin State Gas & Electric Company is planning to extend its electric transmission line from Newfane to Townshend, for which the company is now securing right of way.

RUTLAND, VT.—A new 1200-hp. turbine is being installed at the power plant of the East Pittsford Company in Chittenden. This additional energy will be transmitted over a new transmission line, to be erected from the power plant to the substation in Castleton, where it will be stepped down for distribution for commercial and domestic use.

GREENFIELD, MASS.—The Greenfield Electric Light & Power Company has been granted permission to extend its electric transmission line to Northfield Farms.

SPRINGFIELD, MASS. — The Turners Falls (Mass.) Power & Electric Company has purchased a site of forty acres at Chicopee Junction, on which it will erect a large relay steam generating plant, to cost approximately $1,500,000. The initial installation will have a generating capacity of 40,000 hp. The present plans provide for an ultimate output of 80,000 hp. Three buildings will be erected, the main one 370 ft. by 180 ft. F. L. Hunt is chief engineer. Robert W. Mitchell is local representative.

CLINTON, CONN.—A bill authorizing the Clinton Electric Light & Power Company to issue $100,000 in bonds and $70,000 in capital stock has been passed by the Senate. The proceeds will be used for extensions to the system and for refunding purposes.

DANBURY, CONN.—The Danbury & Bethel Gas & Electric Company has petitioned the State Legislature for permission to increase its capital stock to $1,000,000.

NAUGATUCK, CONN.—The United Electric Light & Water Company is erecting a second 13,200-volt circuit between Waterbury and Naugatuck to increase the capacity of the Waterbury, Naugatuck and Seymour transmission line. The company is also erecting a transmission line between Seymour and Derby. W. T. Pratt of Naugatuck is local superintendent.

Middle Atlantic States

BROOKLYN, N. Y.—Bids will be received by Robert Adamson, fire commissioner, Municipal Building, New York,, N. Y., until May 7 for furnishing and installing new electric-lighting systems at the quarters of engine companies Nos. 239 and 202, and for hook and ladder companies Nos. 101, 103, 104, 105 and 107, borough of Brooklyn. Bids will also be received at the same time and place for furnishing and installing new electric-lighting systems at the quarters of engine companies Nos. 221, 238, 255, and hook and ladder company No. 102, borough of Brooklyn. Blanks and further information may be obtained at the above office.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

NEWARK, N. Y.—Bids will be received by Albert W. Beaven, president of board of managers of Custodian Asylum for Feeble-Minded Women, until May 18 for two new boilers, stokers, auxiliary equipment, piping and heating work at the institution, at Newark, N. Y. Louis F. Pilcher, State Capitol, is state architect.

NEW YORK, N. Y.—Improvements are contemplated by the Interborough Rapid Transit Company to its substation station on Nineteenth Street, to cost about $15,000.

NEW YORK, N. Y.—The New York Telephone Company has purchased a site at Grand View Place and 167th Street, on which it proposes to erect a telephone exchange building at a cost of about $50,000.

PULASKI, N. Y.—The Public Service Commission has granted the Salmon River Power Company of Buffalo permission to purchase the property of the Pulaski Electric Light Company at $60,000, and to acquire the Box property from Fred D. Comy for $15,000; also the completion of distribution system for street and commercial lighting in the villages of Altmar, Lacona and Sandy Creek and the towns of Richland and Orwell, at a cost of about $30,000.

SYRACUSE, N. Y.—Plans are being considered by the New York Central Railroad Company, it is reported, to equip the Auburn division, from Syracuse to Geneva, for electrical operation.

BAYONNE, N. J.—The City Commission has refused the request of the Public Service Electric Company to eliminate improvement work in the city during the present year, in accordance with contract with the municipality, and has authorized the work to proceed, including the extension of street-lighting system on Broadway from Fifth Street to the Central Railroad of New Jersey bridge with underground conduits.

BRIDGETON, N. J.—The Electric Company of New Jersey, with main office in Bridgeton, has closed a contract with the Cumberland Glass Company to furnish energy (750 hp.) for lamps and motors. This includes not only the Cumberland plant proper, but the More-Jonas plant. A contract has also been closed with the Seabrook Farms Company for 200 hp., with I. P. Thomas, manufacturer of fertilizer, Paulsboro, for 1000 hp.; with the Glenshaw Glass Company at Swedesboro for 200 hp., and there will also be an installation at the Hurff canning factory at Swedesboro. These contracts will require the erection of many miles of high-tension transmission lines and substations. W. J. Kyle of Bridgeton is general manager.

ELIZABETH, N. J.—Plans are being considered by the City Council for preliminary surveys and estimates of cost for the proposed municipal electric-light plant.

JERSEY CITY, N. J.—The Board of Education has authorized bids advertised for the installation of electric-lighting systems in Public Schools Nos, 1, 9, 11 and 20. S. Fred Ege is secretary.

KEANSBURG, N. J.—Arrangements are being made by the New York Telephone Company for the installation of a new submarine cable from Annadale, Staten Island, to Keansburg, about 28,900 ft. in length. The new lines will be used for a direct trunk system from Red Bank, Asbury Park and vicinity to New York, allowing the elimination of existing aerial lines.

NETCONG, N. J.—Arrangements are being made by the Willsbrook Light & Power Company of Netcong to connect its lines with the transmission system of the New Jersey Light & Power Company, from which it will purchase energy. Right of way for the proposed transmission line has been secured by the Willsbrook company and preparations are being made for the erection of a substation. Energy will be secured from the Bowlbyville plant of the New Jersey company.

NEWARK, N. J.—Plans are being considered by the Board of Fire Commissioners for improvements to the fire-alarm system, to cost about $5,000. Adam Bosch is superintendent of Telegraph Department.

NEWARK, N. J.—The Board of Freeholders is considering plans for remodeling and extensions to the electric power plant at the County Penitentiary and improvements in the lighting, heating and power systems.

PENNSGROVE, N. J.—The Council is considering the installation of a municipal fire alarm system in Pennsgrove.

WEEHAWKEN, N. J.—The New York Telephone Company has applied to the township committee of North Bergen for permission to install overhead and underground lines in about twenty streets, including Main Street, Hackensack Turnpike and Bergenline Avenue.

WHARTON, N. J.—The Wharton Steel Company is planning to equip the Hibernia iron ore mines for electrical operation. Energy will be transmitted from Wharton to the mining properties in Hibernia.

ERIE, PA.—The City Council has granted the Erie County Electric Company and the Erie Light Company franchise rights for extensions to conduit systems in State Street.

FRANKLIN, PA.—The plant and holdings of the Franklin Electric Company have been purchased by the Citizens' Light & Power Company of Oil City.

GETTYSBURG, PA.—A franchise has been granted to the Washington, Westminster & Gettysburg Railway Company to construct an electric railway in Gettysburg.

KUTZTOWN, PA.—The Town Council is considering the installation of a municipal electric-light plant, to cost about $23,000.

PHILADELPHIA, PA.—Plans are being prepared for the erection of a new boiler house, 30 ft. by 50 ft., at Girard Point, to cost about $12,000, for the Pennsylvania Railroad Company.

PHILADELPHIA, PA.—The United Gas Improvement Company has announced that it will make improvements and extensions to its properties during the present year, at a cost of $1,262,500.

PHILADELPHIA, PA.—The Philadelphia Electric Company contemplates the installation of a new cable railway line and other improvements at its power plant on Christian Street, to cost about $45,000.

PHILADELPHIA, PA.—The Bureau of Health and Charities is asking for bids for the erection of a new power plant and other buildings at the Byberry Hospital. Philip H. Johnson, Land Title Building, Philadelphia, is architect.

PHILADELPHIA, PA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 15 for the installation complete of an electric mail elevator in the United States post office and court house at Philadelphia, Pa. For details see **proposal columns.**

READING, PA.—The Metropolitan Electric Company, it is reported, has placed orders for an additional turbo-generator, to cost about $500,000, which will increase the output of its plant from 30,000 hp. to 62,000 hp.

READING, PA.—The Reading Transit & Light Company and the Metropolitan Electric Company are planning to install underground wires in the existing conduit system in the business section of the city, including connections, etc., at a cost of approximately $1,000,000. The Reading Transit & Light Company has been granted permission by the Public Service Commission to acquire a number of small electric-lighting and railway properties in Berks and Lebanon Counties.

SOUTH BETHLEHEM, PA.—The Town Council of Northampton Heights is considering the installation of a new fire-alarm system.

BALTIMORE, MD.—Contract has been awarded by the United Railway & Electric Company for the erection of a new substation, 60 ft. by 90 ft., at Sollers Point, to the West Construction Company, of Baltimore, Md.

BLUEFIELD, W. VA.—The Appalachian Power Company is reported to be considering extending its railway system from Bluefield to neighboring sections, including about 40 towns, covering a distance of about 50 miles.

WASHINGTON, D. C.—The Chesapeake & Potomac Telephone Company is planning to remodel and enlarge its central exchange at 722 Twelfth Street N. W., at a cost of about $35,000.

WASHINGTON, D. C.—Plans are being considered by J. J. Moebs, Colorado Building, Washington, for the construction of an electric service station at 1829 L Street N. W., to cost about $15,000.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 7, for construction of nine one-story wood frame buildings, including heating and electric-lighting systems and plumbing. Three wards will be required at each of the naval hospital reservations at Newport, R. I., Portsmouth, N. H., and Great Lakes, North Chicago, Ill. Drawings and specifications (No. 2366) can be obtained on appli-

cation to the above bureau or to the commandant of the navy yard and naval stations named.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 14 for repairs and improvements to kitchen, conservatory, greenhouse and power house at the naval station, Washington, D. C. Drawings and specifications No. 2369 can be obtained on application to the above bureau.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval station the following supplies: Portsmouth, N. H., Schedule 1016—twenty-six air compressors complete f.o.b. works; Schedule 1025—four steam-driven torpedo air compressors. Philadelphia, Pa., Schedule 1023—one electric passenger elevator; Schedule 1040—one hydraulic frame bender machine, one 350-ton hydraulic press joggling machine. Norfolk, Va., Schedule 1026—three circulating and air pumps, miscellaneous main air pumps, 22 feed, fire and bilge pumps, etc., 12 lubricating oil pumps, etc. Brooklyn, N. Y., Schedule 1028—four combined aid and circulating pumps, two dynamo air condenser pumps, 18 dynamo-room, hot-well pumps, etc., 16 feed pumps, 15 oil-cooler pumps, etc. Brooklyn, N. Y., Norfolk, Va., Schedule 1027—thirty fuel-oil service pumps. Pensacola Fla., Schedule 1029—230 ft. double braided, rubber-insulated, single-conductor cable, 15,450 ft. lead-covered, paper insulated, single conductor cable, 15,450 ft. lead-covered, paper-insulated, single-conductor cable, 5005 ft. lead-covered, rubber-insulated, duplex cable, 10,400 ft. lead-covered, paper-insulated, duplex cable, 10,900 ft. lead-covered, paper-insulated, 3-conductor cable, 2850 ft. lead-covered, rubber-insulated, 3-conductor cable, 1500 ft. double-silk and single-cotton pothead wire. Brooklyn, N. Y., Mare Island, Cal., Schedule 1046—miscellaneous electrical supplies, distribution boxes, junction boxes, switches, receptacles, etc. Newport, R. I., Schedule 1030—900,000 unannealed brass tubes, 35,000 lb. medium hard-drawn brass tubing. Puget Sound, Wash., Schedule 1003 — miscellaneous seamless copper or bronzed pipe, black-welded steel pipe, seamless black steel pipe. Applications for proposal blanks should give the schedule desired by number.

North Central States

ALPENA, MICH.—Plans are being considered for improvements to the street-lighting system in the business district.

JACKSON, MICH.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 24, for the installation of a complete hoistway, hydraulic freight lift, etc., in the United States post office at Jackson, Mich. For details see proposal columns.

NEW BALTIMORE, MICH.—The Village Council is negotiating with the Eastern Michigan Edison Company of Detroit to furnish electrical service in New Baltimore. If satisfactory arrangements are made an election will be called to submit to the voters the proposal to sell the municipal electric plant. The village has operated a municipal plant for fourteen years.

CINCINNATI, OHIO.—Estimates have been presented to the City Council for the installation of an ornamental lighting system on McMillan Street, from May Street to Alms Place, and on Gilbert Avenue, from Court Street to Locust Street. The cost for McMillan Street is estimated at $14,300 per year, and on Gilbert Avenue at $5,850 per year.

CLEVELAND, OHIO.—Application has been made to the Public Utilities Commission by the Lake Shore Electric Railway Company for authority to issue $51,000 in bonds, the proceeds to be used for improvements, etc.

DAYTON, OHIO.—Bids will be received by A. Giesler, Riebold Building, Dayton, until May 16 for construction and equipment of the new District Tuberculosis Hospital to be located on the Covington Pike and to be erected for Montgomery and Dark counties. Bids are also asked on the erection of motor-driven pumping machinery and connecting same to a driven well, under a separate contract, and laying approximately 1780 ft. of 4-in. cast-iron pipe, for pump and transmission line, including pump house, and for two 80-hp. tubular boilers, sanitary sewer system, etc. Plans are on file at the office of A. H. Wetchampe, superintendent of construction, New Court House, Toledo.

SPRINGFIELD, OHIO.—Work has begun on extensive improvements to the plant of the Springfield Light, Heat & Power Company, which will involve an expenditure of $125,000, and will include the construction of a 5200-ton coal storage bin, a new boiler room, 60 ft. by 70 ft., to provide space for four new boilers; also new transformers, stations, purifiers, condensers, etc.

BRANDENBURG, KY. — The Kentucky Lithographic Stone Company of Louisville is contemplating changing its local quarry and manufacturing plant to electric drive. The company proposes to install an isolated electric generating plant and is considering using gas for fuel.

CAMPBELLSVILLE, KY.—The Campbellsville Electric Light & Power Company, recently organized with a capital stock of $40,000, proposes to build a plant here. Charles Walls, W. G. Hesser, C. L. Hesser and B. Walls are interested.

WINCHESTER, KY. — The Kentucky Court of Appeals has handed down a decision upholding the validity of the $180,000 bond issue voted by the city of Winchester for the establishment of a waterworks system. The construction of a hydroelectric power plant on the Kentucky River to supply power for pumping water for the city is included in the plans.

GARY, IND.—Authority has been granted to Charles B. Davidson, receiver of the Gary & Interurban Traction Company, to borrow $192,000 on receiver's certificates, the proceeds to be used for the purchase of new equipment and for improvements to system.

GARY, IND.—The Gary & Hobart Traction Company, recently incorporated, with a capital stock of $60,000, proposes to construct and operate an electric railway between Gary, East Gary, New Chicago and Hobart; also to furnish electricity for lamps, heaters and motors in these cities. William Earle, Ora L. Wildermuth, Grant Crumpacker and others are interested.

HAMMOND, IND.—A petition has been filed with the Public Service Commission by the Northern Indiana Gas & Electric Company for authority to issue and sell $609,000 in bonds and $93,000 in notes. The company also asks for permission to sell $151,000 in bonds of the Indiana Lighting Company, now held in the treasury of the former company. The proceeds to be used for refunding purposes and for improvements and extensions.

KOKOMO, IND.—Steps have been taken by the Indiana Railways & Light Company for the erection of a larger terminal in Kokomo, to cost about $150,000. New equipment for power plant, most of which has been purchased, extensions to the Kokomo street railway system and improvements to the electric-lighting system are included in the project.

DIXON, ILL.—Contracts have been awarded by the Illinois Northern Utilities Company for the erection of a new steam generating plant in Dixon as follows: For substructure and superstructure to the Adams Construction Company of Chicago, at $45,000, and for structural steel work to the Lakeside Bridge & Iron Company of Milwaukee, Wis., at $23,000.

DU QUOIN, ILL.—The Du Quoin, Christopher & Eastern Traction Company is considering the construction of an electric railway from Du Quoin easterly to West Frankfort and from Du Quoin to Carbondale.

HARVARD, ILL.—The Chicago, Harvard & Geneva Lake Railway Company has been granted a franchise by the City Council to construct an electric railway on West Front Street, between West Diggins Street and South Eastman Street.

LOCKPORT, ILL.—Bids will be received by the clerk of the Sanitary District of Chicago, 700-910 South Michigan Avenue, Chicago, until May 17, as follows: Division (A) for a vertical hydraulic turbine; (B) an alternating-current generator, to be installed in the power house in Lockport. Specifications and forms of proposal may be obtained from the clerk of the board or the electrical engineer. John McGillen is clerk of the board.

PRINCETON, ILL.—Local business men are advocating the installation of an ornamental lighting system in the business district. This, it is understood, would require the installation of an additional generating unit in the municipal electric-light plant, to cost about $18,000. A special election may possibly be called to vote on the proposal to provide funds for the proposed improvements.

SUMMIT, ILL.—Bonds to the amount of $6,000 have been voted for extensions to the street-lighting system.

EMBARRASS, WIS.—Plans are being considered for the construction of a hydroelectric power plant in Embarrass.

GLENWOOD, WIS. — The Glenwood-Downing Light & Power Company contemplates extending its electrical service to Boyerville.

MILWAUKEE, WIS.—The construction of a new power and boiler house, 50 ft. by 100 ft., with a 100-ft. stack, is contemplated for the Milwaukee Protestant Orphans' Asylum, Prospect and East North Avenues, Milwaukee. Schuchardt & Judell have charge of the work.

WONEWOC, WIS.—Bids are being asked by the Power Engineering Company, 510 Corn Exchange, Minneapolis, Minn., for construction of power house, transmission equipment, etc., for a hydroelectric power plant at Wonewoc, also for auxiliary plant with internal combustion engine. A. B. Gale of Wonewoc is owner.

NEW VIENNA, IOWA.—The Eastern Iowa Electric Company of Dyersville will soon begin work on the erection of the overhead electric distributing system to supply electricity in New Vienna.

RED OAK, IOWA.—The date for receiving bids for wiring and furnishing fixtures for the court house at Red Oak, Iowa, has been changed from May 1 to May 7, 1917. C. D. Forsbeck is county engineer.

RUTHVEN, IOWA.—The Northern Gas & Power Company has applied for a franchise to supply electrical service in Ruthven.

SIOUX CITY, IOWA.—Work, it is reported, will soon begin on extensive improvements to the system of the Sioux City Gas & Electric Company, which will nearly double the output of the plant. The proposed improvements will cost about $250,000 and will include the installation of a 3000-kw. turbo-generator. An addition will be erected to the power station and part of the boiler room will be rebuilt.

BOONVILLE, MO.—Plans are being prepared for improvements to the power house at the Kemper Military School, including the installation of additional generators and boilers.

HARRISONVILLE, MO.—A special election will soon be called to submit to the voters the proposal to award a franchise to L. R. Green & Son of Pleasant Hill to supply electricity in Harrisonville.

MALTA BEND. MO.—The installation of an electric-lighting system in Malta Bend is under consideration.

MINE LAMOTTE, MO.—The Missouri Metals Corporation has awarded the contract for construction of power house, about 60 ft. by 150 ft., to the Unit Construction Company, Title Guaranty Building, St. Louis. Diesel engines, it is understood, will be installed.

PARNELL, MO.—The Maryville (Mo.) Electric Light & Power Company has been granted a franchise to supply electricity in Parnell for commercial purposes.

ST. LOUIS, MO.—A building permit has been granted to the Union Electric Light & Power Company for the construction of a three-story power house at 908 St. Charles Street, St. Louis, to cost about $75,000.

SMITHVILLE, MO.—The local electric-light plant, recently destroyed by fire, will be rebuilt. The cost of the equipment is estimated at about $7,500. C. Morton and H. Gordon are owners.

VALLEY PARK, MO.—Plans are being considered for the installation of an electric-lighting system in Valley Park.

JUD, N. D.—The installation of an electric-lighting plant in Jud is under consideration.

RYDER, N. D.—Plans are being considered by E. E. Freeden, owner of the local electric plant, for changing the system from direct to alternating current.

VOLIN, S. D.—The Citizens' Light & Power Company is reported to have decided to increase the output of its local plant.

ALBION, NEB.—The Albion Electric Light & Power Company is installing a new 35-in. type "K" Leffel waterwheel and a 125-kw. vertical generator, directly connected. The company has also awarded a contract for the construction of a new penstock to the Western Bridge & Construction Company of Omaha.

HARRISON, NEB.—Bids will be received by the city of Harrison until May 9 for the construction of a municipal electric-light plant, including construction of power house and a 10,000-gal. fuel-oil tank; one 35-hp., one 25-hp. and one 15-hp. oil engine, one 30-kw., one 25-kw. and one 15-kva., 60-cycle, 2200-volt generator, air compressor and water-cooling apparatus. E. F. Pontius is chairman. Royal D. Salisbury, 1455 Gaylord Street, Denver, Col., is engineer.

AGRA, KAN.—At an election held recently the proposal to issue $8,000 in bonds for the installation of a municipal electric-light plant was carried.

BALDWIN, KAN.—Bonds to the amount of $20,000 have been authorized for improvements to the municipal electric-light plant and water-works system.

KANSAS CITY, KAN.—The installation of an ornamental street-lighting system and other improvements, between First Street and the Fair Grounds, is under consideration.

TORONTO, KAN.—Bonds to the amount of $15,000 have been voted for the installation of an electric-lighting system in Toronto.

Southern States

ASHEVILLE, N. C.—Improvements are contemplated by the Asheville Telephone & Telegraph Company, which include replacing poles within the fire limits on Charlotte and Woodfin Streets, and in other districts with conduits. The cost is estimated at $70,000.

DURHAM, N. C.—The Durham Traction Company has placed orders for a new turbine, which will more than double the present output of its plant.

WILMINGTON, N. C.—The controlling interest of the Tidewater Power Company, which controls the electric and gas properties, street railways, interurban electric railway and 1500 acres of suburban real estate in Wilmington, has been purchased by Brooks & Company of Scranton, Pa. L. H. Conklin of Scranton, Pa., general manager of the Brooks & Company properties, has taken charge of the Tidewater properties.

ATLANTA, GA.—The Georgia Railway & Power Company is erecting a new 110,000/38,000-volt substation at Norcross to feed the Stone Mountain line at 38,000 volts. This line, which has substations at Stone Mountain, Lithonia, Conyers, Covington, Social Circle and Monroe, was formerly operated from the Boulevard station, Atlanta. The line from Norcross to Stone Mountain will be 10 miles long (cutting out a total of high and low voltage lines of 25 miles). The station will be equipped with two banks of three 1000-kva. General Electric transformers, with one spare for each bank.

TAMPA, FLA.—Rights of way are being obtained by the West Coast Electric Railway Company for the construction of an electric railway from Tampa to Sarasota and Venice, a distance of about 65 miles. A. E. Townsend of Tampa is general manager and chief engineer.

DYERSBURG, TENN.—The Water and Light Department is considering asking for bids for motor-driven centrifugal pumps for a deep well. S. R. Blakeman is superintendent.

LAWRENCEBURG, TENN. — Preparations are being made for extensions to the ornamental lighting system.

OOLETEWAH, TENN.—Steps have been taken to organize a company under the name of the James County Power Company to supply electricity in Ooletewah and vicinity. The new company will secure energy from the Ocoee plant of the Tennessee Power Company, which will install a transformer station here.

PULASKI, TENN.—The Board of Mayor and Aldermen has voted to purchase an additional electric generating unit for the municipal electric-light plant. A day electrical service will soon be established.

FORT SMITH, ARK.—Surveys are being made by the Fort Smith Light & Traction Company for an extension of its street railway system to Jenny Lind and Greenwood.

HUNTINGTON, ARK.—The Fort Smith Light & Traction Company is contemplating erecting an electric transmission line from Fort Smith to Huntington, to furnish electrical service there.

JENNY LIND, ARK.—Surveys have been made by the Fort Smith (Ark.) Light & Traction Company for the erection of a high-tension transmission line to Jenny Lind and Greenwood.

ADA, OKLA.—The proposal to issue $60,000 in bonds for improvements to waterworks system will be submitted to the voters. The proposed work will include the construction of a new reinforced concrete flume for water power plant and a 500,000-gal. elevated tank. The Benham Engineering Company, Colcord Building, Oklahoma City, is consulting engineer.

ARDMORE, OKLA.—Plans are being prepared for the construction of a hydroelectric power plant on the Washita River, to develop 2500 hp. and to store water to irrigate 40,000 acres. J. A. Cosner and others are interested. J. W. Maxey of Houston, Tex., is engineer.

BUTLER, OKLA.—The installation of a municipal electric-light plant, to cost about $6,000, is under consideration.

CARMEN, OKLA.—Bonds to the amount of $25,000 have been voted for the construction of an electric-light plant in Carmen.

HASKELL, OKLA.—The Central Oklahoma Light & Power Company of Oklahoma City has been granted a franchise to supply electricity for lamps and motors in Haskell.

MANGUM, OKLA.—The City Council has engaged the Benham Engineering Company, Colcord Building, Oklahoma City, to appraise the local electric-light plant, and make an estimate of cost of installing a new municipal electric plant.

MOUNDS, OKLA.—The Central Oklahoma Light & Power Company of Oklahoma City has applied for a franchise to supply electricity in Mounds.

TULSA, OKLA.—The George A. Fuller Construction Company, Dwight Building, Kansas City, Mo., has been awarded the contract for the construction of an office building at Fourth and Boston Streets, to cost about $750,000, for J. S. Cosden, Daniels Building. Contracts will be awarded later for electric wiring, electric passenger elevators, lighting fixtures, steam heating system, etc., by H. F. Holt, architect, 315 East Tenth Street, Kansas City, Mo.

VINITA, OKLA.—The Public Service Company of Oklahoma is installing a 100-kw., three-phase, 60-cycle, 2200-volt, Allis-Chalmers generator, driven by a 250-hp. Buckeye gas engine and a 250-hp. Babcock & Wilcox boiler, in its local plant, and is also erecting a 6600-volt transmission line to the Sinclair refinery, 3 miles distant.

WAPANUCKA, OKLA.—The City Council is considering calling an election to submit to the voters the proposal to issue bonds for the installation of a municipal electric-light plant.

BALLINGER, TEX.—The capital stock of the Ballinger Light & Ice Company has been increased from $50,000 to $90,000.

BEAUMONT, TEX.—The Eastern Texas Electric Company has sold $600,000 in bonds, the proceeds of which will be used to take up the floating debt of $90,000; to install 5300-hp. additional generating equipment at the Port Arthur plant and for the erection of a 33,000-volt transmission line between Port Arthur and Beaumont.

COPPERAS COVE, TEX.—A franchise has been granted to C. W. Roberts to supply electricity in Copperas Cove.

DALLAS, TEX.—The Standard Utilities Construction Company, recently incorporated with a capital stock of $100,000, contemplates the construction of an interurban electric railway from Dallas to Slidell, a distance of 48 miles. The project includes the construction of a large electric power plant. M. W. Davenport of Denton, Tex.; Ira E. Cornelius of Muskogee, Okla., and C. F. Hopkins of Tulsa, Okla., are among the incorporators.

POLYTECHNIC, TEX.—Plans are being considered for improvements to the street-lighting system.

SAN ANGELO, TEX.—The Texas Electric Light & Power Company, recently incorporated with a capital stock of $200,000, will take over and operate the local electric-light and power plant and transmission system in this section. The power station will be enlarged and extensions made to the transmission lines. The company will also build and operate a street railway system in San Angelo and construct an interurban railway to Ballinger, a distance of about 30 miles. Charles W. Hobbs of San Angelo is president of the company.

SEMINOLE, TEX.—The installation of an electric-lighting system in Seminole is under consideration. W. M. Breckon is reported interested in the project.

WICHITA FALLS, TEX.—The Wichita Falls Electric Company is contemplating extending its electric transmission lines to supply electrical service in the towns of Bowie, Electra, Burkburnett, Henrietta and Iowa Park.

Pacific and Mountain States

CHESAW, WASH.—Plans are being considered for the installation of an electric-light and power plant in Chesaw to supply electricity for both street and commercial lighting. William Powell of Chesaw is interested in the project.

PORT ANGELES, WASH.—The City Council is considering calling an election to submit to the voters the proposal to issue $25,000 or $30,000 in bonds for extensions to the local electric-lighting system.

BEND, ORE.—The Bend Water, Light & Power Company will soon begin work on the erection of an addition to its power plant. The new equipment will include a new 600-kw. generator and a 600-hp. waterwheel. The cost of the work is estimated at $30 000.

GARIBALDI, ORE.—The Coast Power Company of Tillamook, which some time ago took over the holdings of the smaller electric companies in this section, is planning the installation of street-lighting systems in the Tillamook Beach resorts, including Garibaldi, Bar View, Rockaway, Saltair, Manhattan and other smaller places. C. J. Edwards will be in charge of the work.

SALEM, ORE.—Application has been filed in the office of the State Engineer by Scott Catterson for permission to appropriate 40 second-ft. of water from Donner and Blitzen River, in Harney County, for the development of 2070 hp. The plans provide for the construction of a dam 60 ft. long and a canal and pipe line 9 miles in length.

BISHOP, CAL.—The Darwin Development Company is contemplating the construction of an electric railway along the south shore of Owens Lake to connect with the Southern Pacific Railroad tracks at Olancha, a distance of 23 miles.

CHINO, CAL.—The installation of an ornamental street-lighting system in Chino is under consideration.

FRESNO, CAL.—The San Joaquin Light & Power Company is erecting an electric transmission line, 5 miles long, to the Lost Hills Development Company's property in the Lost Hills field, which was recently taken over by the General Petroleum Company. Arrangements are being made for the wiring of the lease and the installation of a complete electrical equipment.

HOLTVILLE, CAL.—The State Railroad Commission has approved the contract of the Holton Power Company under which the company will erect a 55,000-volt electric transmission line to Yuma, a distance of 53 miles. The company will also erect telephone and telegraph lines across the sandhills to the Colorado River.

LOS ANGELES, CAL.—The City Council has approved the assessment district for the ornamental lighting system for Camino Palermo and has authorized the city attorney to prepare the necessary ordinance.

MANTON, CAL.—The local electric plant and water rights, owned by V. B. Taylor, has been purchased by the Northern California Power Company of San Francisco, at $5,000. Extensions and improvements will be made to the system.

BUTTE, MONT.—In compliance with governmental orders directing the dismantling of all privately operated wireless plants, the Montana Power Company has announced that it would at once cease the use of its wireless facilities between various substations. The company will resort to telephones which are already installed.

JUDITH GAP, MONT.—An electric-lighting system is being installed in Judith Gap by the Montana Power Company of Butte.

FORT MORGAN, COL.—Extensive improvements have been completed at the municipal electric-light plant, including the construction of a new boiler house, erection of smokestack and installation of a new 253-hp. boiler. Estimates are now being received for the installation of a new 500-kw. generating unit to be connected either to a reciprocating engine or a steam turbine; also on a deep well, 180 ft. deep, with a vertical centrifugal pump, directly connected to a 50-hp. motor. George C. Cox is superintendent.

YUMA, COL.—New equipment, including a 100-hp. Fairbanks-Morse engine and a 67½-kw., three-phase, 60-cycle, 2200-volt Westinghouse generator, is being installed in the municipal electric light plant. An addition is also being erected to the power station to provide space for the new unit.

Canada

EDMONTON, ALTA.—J. H. Moir, traffic manager of the Edmonton (municipal) Radial Railway System, has recommended the installation of a motor-generator set.

MONCTON, N. B.—The Moncton Tramways, Electric & Gas Company is considering extensions to its tramway system.

GALT, ONT.—The Galt Hydro-Electric Commission expects to erect a new substation, 46 ft. by 107 ft., three stories and basement, to be equipped with switching apparatus, three additional transformers, 750-kva., three-phase. A. B. Scott is secretary.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until May 19 for furnishing track bolts, rivets, sheet copper, sheet brass, grommets, electric cable, magnet wire, resistance testing set, spark plugs, storage batteries, dry cells, motor-driven planer, drill press, etc. Blanks and general information relating to this circular (No. 1141) may be obtained from the above office or the offices of the assistant purchasing agents, 224 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

Directory of Electrical Associations

Printed in the First Issue of Each Month

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, J. P. Ross, Birmingham Railway, Light & Power Co.

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AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country. Annual convention, Hot Springs, Va., June 26-29.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

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COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col.

COMMERCIAL SECTION, N. E. L. A. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

EASTERN NEW YORK SECTION, N. E. L. A. Asst. secretary, J. L. Hemphill, General Electric Company, Schenectady, N. Y.

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ELECTRICAL MANUFACTURERS' CLUB. Secretary, H. B. Crouse, Crouse-Hinds Co., Syracuse, N. Y.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill. Semi-annual meeting, Hot Springs, Va., May 22-24.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, 34 Ellis St., San Francisco, Cal.

ELECTRIC POWER CLUB. Secretary, C. H. Roth, 1410 West Adams St., Chicago. Meeting, Hot Springs, Va., June 11 and 12.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Affiliated with the N. E. L. A. Secretary, A. Jackson Marshall, 29 West 39th St., New York.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York.

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ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary, R. H. Abbott, Petersburg, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, G. H. Stickney, Fourth and Sussex Sts., Harrison, N. J. Sections in New York, Philadelphia, Pittsburgh, Cleveland, Chicago and Boston. Annual convention, Newark, N. J., September.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind.

INDIANA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, George Skillman, Indianapolis, Ind.

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INSTITUTE OF RADIO ENGINEERS. Secretary, David Sarnoff, 111 Broadway, New York.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England.

IOWA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. T. Humphrey, Waterloo, Iowa.

IOWA SECTION, N. E. L. A. Secretary-treasurer, L. E. Caldwell, Iowa City, Iowa. Annual meeting, Des Moines, May 24 and 25.

JOVIAN ORDER. Jupiter (president), Henry L. Doherty, New York City; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

KANSAS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. A. Mercer, 108 West Eighth Ave., Topeka, Kan.

KANSAS PUBLIC SERVICE ASSOCIATION. Secretary, E. A. Wright, Manhattan, Kan.

KENTUCKY ASSOCIATION OF ELECTRICAL CONTRACTORS. Secretary, Herbert E. Ottenheimer, Louisville, Ky.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. J. Zeigler, 227 Bourbon St., New Orleans.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Augusta, Me.

MICHIGAN SECTION, N. E. L. A. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

MINNESOTA ELECTRICAL ASSOCIATION. Secretary, Fred A. Otto, Albert Lea, Minn.

MINNESOTA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, G. M. Jones, 14 Seventh St., N. Minneapolis, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the N. E. L. A. Secretary-treasurer, R. H. Smith, Jackson, Miss.

MISSOURI ASSOCIATION OF PUBLIC UTILITIES. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, William L. Smith, Concord, Mass.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, 33 West 39th St., New York.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, H. C. Brown, 41 Martin Building, Utica, N. Y. Next meeting, New Orleans, October, 1917.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Bldg., Chicago, Ill.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, B. E. Egan, Room 201, Union Pacific Building, Omaha, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 15 State St., Boston, Mass.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. A. Bursiel, 149 Tremont St., Boston, Mass. Annual convention, New London, Conn., Sept. 11-14.

NEW MEXICO ELECTRICAL ASSOCIATION. Secretary-treasurer, E. A. Thiele, Roswell, N. M.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Secretary, Franz Neilson, 120 Broadway, New York.

NEW YORK ELECTRICAL SOCIETY. Secretary, George H. Guy, 29 West 39th St., New York.

NORTHWEST SECTION, N. E. L. A. Secretary, J. F. Farquhar, Washington Water Power Company, Spokane, Wash.

NORTHERN WHITE CEDAR ASSOCIATION. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO SOCIETY OF MECHANICAL ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus.

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary-treasurer, J. W. Oberender, 502 Dekum Building, Portland, Ore.

PACIFIC COAST SECTION, N. E. L. A. Secretary, A. H. Halloran, Crossley Bldg., San Francisco, Cal.

PENNSYLVANIA ELECTRIC ASSOCIATION, State Section N. E. L. A. Secretary, H. M. Stine, 211 Locust St., Harrisburg, Pa.

PUBLIC SERVICE ASSOCIATION OF VIRGINIA. Secretary, W. J. Kehl, Virginia Railway & Power Co., Richmond, Va.

PUBLIC UTILITIES ASSOCIATION OF WEST VIRGINIA. Secretary, W. C. Davisson, West Virginia Water & Electric Co., Charleston, W. Va.

RADIO CLUB OF AMERICA. Secretary, David S. Brown, 206 West 86th St., New York.

ROCKY MOUNTAIN ASSOCIATION OF MUNICIPAL ELECTRICIANS. President, Lawrence Stone, Denver, Col.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

SOUTH DAKOTA ELECTRIC LIGHT ASSOCIATION. Secretary, A. H. Savage, Dakota Light & Power Co., Flandreau, S. D.

SOUTHEASTERN SECTION, N. E. L. A. Secretary-treasurer. Thomas E. Peters, Columbus, Ga.

SOUTHERN CALIFORNIA ELECTRICAL CONTRACTORS AND DEALERS' ASSOCIATION. Secretary, H. C. Bower, 602 Metropolitan Bldg., Los Angeles, Cal.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

SOUTHWESTERN SOCIETY OF ENGINEERS. Secretary, Prof. A. F. Barnes, State College, N. M.

TEXAS STATE ASSOCIATION OF ELECTRICAL CONTRACTORS. Secretary, Eugene Ashe, Dallas, Tex.

TRI-STATE WATER & LIGHT ASSOCIATION. Secretary-treasurer, W. F. Steiglitz, Columbia, S. C.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. H. West, Rutland, Vt.

VIRGINIA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, E. M. Andrews, Richmond.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 175 Jackson Bldg., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, E. N. Layfield, 1735 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Building, Milwaukee, Wis.

1,223,357. Composite Titanic-Oxide Pigment and Method for Producing the Same; Louis E. Barton, Niagara Falls, N. Y. App. filed Aug. 29, 1916. Improvement.

1,223,375. Electrical Toy; Gale E. Elliott, Needles, Cal. App. filed Dec. 14, 1915. Toy motor.

1,223,417. Socket; Herman G. Pape, New York, N. Y. App. filed June 23, 1916. Bracket having open slots to guide the slide and to permit ease of assembling and disassembling.

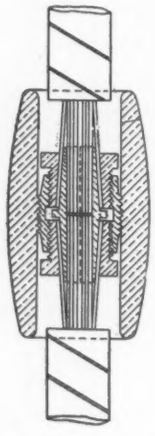
1,223,434. Manufacture of Electric Cables; William F. Smith, Brooklyn, N. Y. App. filed May 23, 1914. Pairs of insulated conductors for use in electric cables.

1,223,437. Protective System; James B. Speed, West New Brighton, N. Y. App. filed Sept. 3, 1915. Relates to the operation of protective reactances designed to protect the apparatus included in high power transmission circuits.

1,223,444. Joint for Electric Cables; Albert E. Tanner, Stretford and Ernest Alexander Claremont, High Leigh, England. App. filed July 22, 1916. Improvements.

1,223,449. Dynamo-Electric Machine; William A. Turbayne, Niagara Falls, N. Y. App. filed Sept. 16, 1916. Improved.

1,223,467. Means for Attaching Electrical Appliances to Conduit Outlet Boxes; Carl H. Bissell, Syracuse, N. Y. App. filed June 19, 1911. Comprises a body for engaging one face of the margin of the wall around the opening.



1,223,444.—Joint for Electric Cables

1,223,471. Apparatus for Charging Storage Batteries; Arthur R. Bullock, Cleveland, Ohio. App. filed Sept. 20, 1916. Produces a pulsating direct current.

1,223,472. Method of Running a Synchronous Motor; Arthur R. Bullock, Cleveland, Ohio. App. filed Sept. 20, 1916. Improved.

1,223,473. Current-Converting Device; Arthur R. Bullock, Cleveland, Ohio. App. filed Sept. 20, 1916. Equalizes the flow of current from a plurality of terminals of a circuit in which a pulsating current is flowing.

1,223,475. Calcining Furnace; William R. Clymer, Lakewood, Ohio. App. filed Oct. 16, 1915. Continuously and uniformly heating the materials to a high temperature.

1,223,481. Factory Fire-Drill System; David G. Dee, Chicago, Ill. App. filed June 7, 1915. Improvements.

1,223,527. Signal Device for Elevator Systems; Charles D. Seeberger, New York, N. Y. App. filed March 13, 1914. Adjacent cars are independently actuated and controlled both up and down in the same shaft.

1,223,530. Automatic Electric Controller; Burton W. Sweet, Cleveland, Ohio. App. filed April 21, 1913. Adapted to cut automatically into a translating circuit a resistance upon a sudden increase in the current which is flowing through the circuit.

Record of Electrical Patents

Notes on United States Patents issued on April 24, 1917

1,223,532. Lamp Hanger; Allison J. Thompson, Cleveland, Ohio. App. filed Jan. 3, 1916. Hanger member is properly centered and placed with respect to the main hanger member.

1,223,549. Circuit-Protecting Apparatus; James G. Zimmerman, Milwaukee, Wis. App. filed May 17, 1912. A fluid current-conducting body which is responsive in a manner to current passing therethrough to cause operation of circuit breaker upon the occurrence of abnormal circuit conditions.

1,223,620. Stopping Mechanism for Winding Machines; Claes Ryden, Cranston, R. I. App. filed Nov. 19, 1914. Automatically arrests the winding operation at the completion of each layer of wire so that certain steps in the process of building up the coil can be performed manually.

1,223,623. Fuse Device; Edmund O. Schweitzer and Nicholas J. Conrad, Chicago, Ill. App. filed Dec. 20, 1913. For taking care of extra high potentials.

1,223,669. Electrical Heating Attachment for Soldering Irons; John G. Clemens, Buffalo, N. Y. App. filed Feb. 27, 1917. Includes two carbons with which are electrically connected the conductor wires leading from the source of electrical supply and these carbons are so supported that they will be held with their points in contact with the head of the soldering iron as they are consumed.

1,223,674. Water Heater and Steam Boiler; Major E. Dearing, Salt Lake City, Utah. App. filed Oct. 11, 1916. Heating devices are self-contained with a hollow removable section co-operatively related to the heating cells or chambers in a novel manner.

1,223,699. Conduit Threader; Stephen Kamowski, Nanticoke, Pa. App. filed May 6, 1915. Provides a means for drawing wires, cables or analogous connections through a conduit tube or similar duct.

1,223,704. Electric Generator; Leon J. Le Pontois, Cleveland, Ohio. App. filed May 18, 1911. For use in connection with internal-combustion engines.

1,223,729. Electric Water Heater; Frank C. Perkins, Buffalo, N. Y. App. filed Dec. 1, 1916. Improvements.

1,223,750. Cable Box; Albert A. Wakefield, Chicago, Ill. App. filed May 14, 1910. For use in high-potential systems.

1,223,789. Burglar-Alarm System; Simon B. Hess, New York, N. Y. App. filed May 17, 1915. Person using the alarm system may select and use any means of exit as the last exit.

1,223,791. Lineman's Device; Van Buren Jackson, Pedro Miguel, Canal Zone. App. filed April 24, 1916. For making a connection or tap from a high line wire while the current is flowing through it.

1,223,865. Electric-Conduit Fitting; Daniel C. Gidley, Winthrop, Mass. App. filed April 10, 1916. Electrical appliance supported thereby can be adjusted axially and easily adapted to different conditions.

1,223,869. Hand Lamp; Carl Hambuechen, Belleville, Ill. App. filed Sept. 30, 1916. Improved means for making and breaking the electrical connection.

1,223,881. Electrical Insulation; Willis A. Ishler, Pittsfield, Mass. App. filed Sept. 11, 1916. Insulating barriers or pads such as are used for insulating electrical windings.

1,223,883. Portable Electric Lamp; Lawrence F. James and Richard F. James, New York, N. Y. App. filed Nov. 2, 1916. Hand or self-contained type.

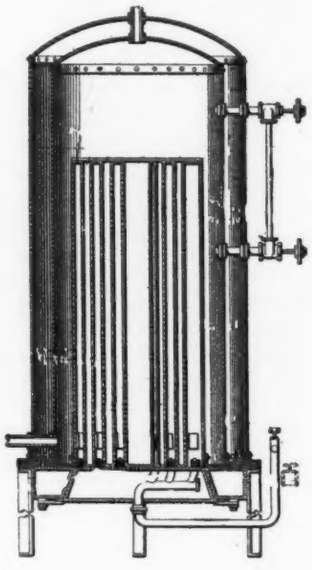
1,223,909. Disk Strain Insulator; Louis Steinberger, Brooklyn, N. Y. App. filed Jan. 3, 1913. Structure which comprises ridges formed on the surface of the disk radiating from the body, the ridges, after leaving the body, being so shaped or curved as to dispose a plurality of distinct ridges in the path of any current tending to creep radially across the surface of the disk.

1,223,916. Lightning Arrester; Frederick B. Wiegan, Cleveland, Ohio. App. filed April 29, 1915. Will ground the high-potential pulsating destructive electric current produced in lightning discharges.

1,223,958. Metallic-Filament Incandescent Electric Lamp; Emil G. Barnes, London, England. App. filed Oct. 3, 1912. Improvements.

1,223,986. Electrode and Coating Therefor; Jesse C. King, Montreal, Quebec, Canada. App. filed July 31, 1916. For use in electric furnaces.

1,223,987. Cut-Out Switch for Series Loops; William A. Kirkland, Cedar Falls, Iowa. App. filed Feb. 14, 1916. Make-and-break device in a series circuit of loops capable of use in switching off a loop from the circuit while leaving the remainder of the circuit closed.



1,223,674.—Water Heater and Steam Boiler

1,224,030. Water-Tight Lamp Socket; Stanley B. Smith, St. John, N. B. Canada. App. filed April 23, 1915. Resilient water-tight sleeve attached to and forming a part of the socket.

1,224,057. Method of Recovering Zinc and Iron from Solutions Thereof; Charles E. Baker, Chicago, Ill. App. filed Jan. 26, 1917. Simultaneously deposits the metals and then effects a separation thereof by vaporizing and recovering the zinc.

1,224,116. Electric Switch; Ragnar O. W. Lundin, New Britain, Conn. App. filed Dec. 16, 1915. Flush type.

1,224,117. Electric Water Heater; Samuel D. Nesmith, La Jolla, Cal. App. filed Nov. 8, 1916. Suitable insulating material through which a series of narrow flat channels extend and within which insulating material multiple-connected conductors are embedded.

1,234,118. Fuse Box; Roscoe Ratcliffe, New Britain, Conn. App. filed Aug. 14, 1916. Protects the interior of the box when the fuses are not in place.

1,224,119. Safety Switch; Alexander K. Sutherland, New Britain, Conn. App. filed May 4, 1916. Inclosed-type switch.

1,224,122. Storage-Battery Locomotive; Raymond Mancha, St. Louis, Mo. App. filed Feb. 5, 1917. Improvement.